

3.0 DESIGN CONCEPT ALTERNATIVES

3.1 INTRODUCTION

Five I-10 Widening Alternatives have been developed to improve the traffic carrying capacity of I-10 between State Route 51 and the Santan Freeway. In addition to the I-10 Widening Alternatives, 16 Local Access Options have been developed to retain the existing access to the local arterial street system.

The Regional Transportation Plan (RTP) and Transportation Improvement Plan (TIP) includes the construction of separate express and local lanes (previously termed Collector-Distributor roads) on I-10 between Buckeye Road and Baseline Road in accordance with the *Interstate 10 Corridor Refinement Study* (1988).

This concept would provide independent roadways to separate regional traffic (on the express lanes) from local traffic (on the local lanes), thereby eliminating the current weaving maneuvers that contribute to severe congestion throughout the corridor during the peak travel periods. The ramp connections to SR 143 and the local arterial street interchanges would enter and exit the freeway system from the local lanes, allowing travelers in the express lanes to pass through the corridor more efficiently. Conversely, travelers on the local lanes would not conflict with the high volume of regional traffic traveling through the study area each day.

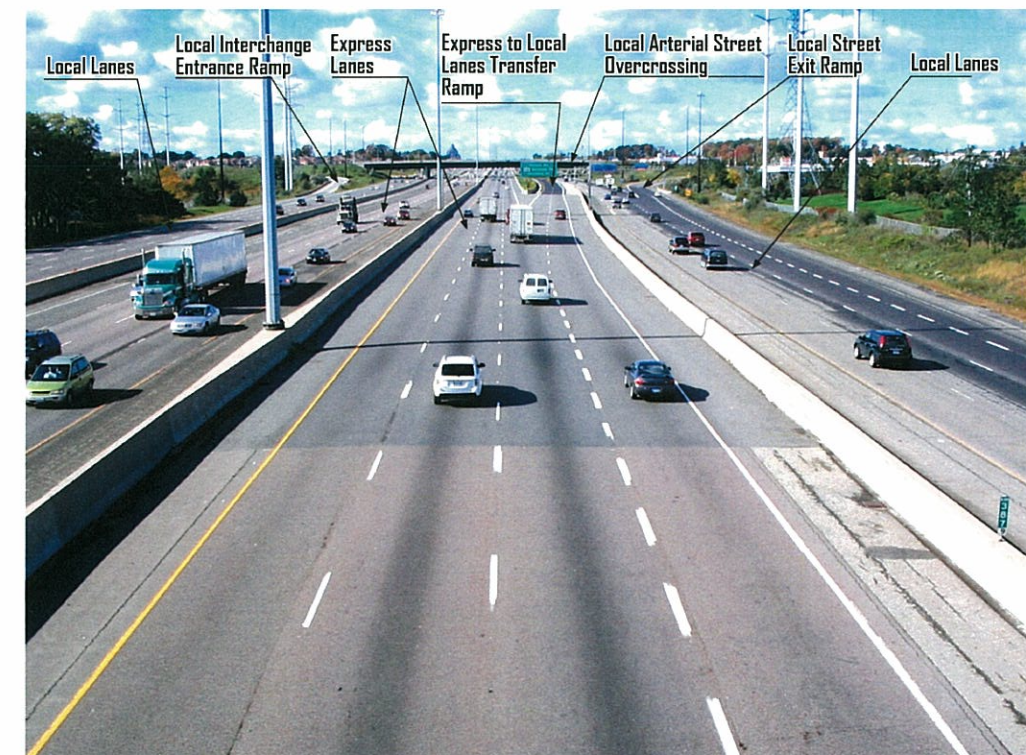
“Express lane to local lane” and “local lane to express lane” transfer ramps would provide access between the express and local lanes at selected locations. The following pictures represent the existing Highway 401 in Toronto, Canada that successfully operates an Express/Local Lane facility within their metropolitan area.

The Express/Local lane concept that was developed in 1988 was based upon Year 2005 volume projections that forecast 250,000 vehicles per day (vpd) at the Broadway Curve. Recent traffic counts that were conducted in 2006 indicate the volume of traffic traveling through the Broadway Curve is approximately 294,000 vpd.

Subsequently, the purpose of this study is to: 1.) evaluate the existing and future levels-of-service along the I-10 corridor; 2.) evaluate the operational performance of the I-10 Express/Local lane concept recommended from the *I-10 Corridor Refinement Study* with Design Year 2030 traffic volume projections; 3.) develop an ultimate plan for this segment of the I-10 corridor that will operate efficiently with the projected 2030 travel demand; and, 4.) develop a phased implementation plan for programming staged construction projects with the funding identified in the RTP and as additional funding may become available in the future.



Existing Highway 401 Express/Local Lane Freeway System



Highway 401 Express to Local Lanes Transfer Ramp,
Arterial Street Ramp Connections to Local Lanes

3.2 DESIGN CONTROLS

I-10 is classified as a controlled access Urban Principal Arterial-Interstate. A summary of the design controls for the I-10 express and local lanes is provided in Tables 20 and 21.

Table 20 – Design Controls for I-10 Express Lanes

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed (existing):	60 mph (MP 147.5 to MP 156) 65 mph (MP 156 to MP 160.9)
Superelevation:	Match existing (0.10 ft/ft maximum)
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Median:	12 ft.
- Outside:	12 ft.
HOV Buffer Width:	4 ft.
Maximum Horizontal Curve:	5 degree, 15 minutes (60 mph) 4 degree, 16 minutes (65 mph)
Maximum Gradient:	Not applicable, match existing
Taper Rate:	60:1 (60 mph) 65:1 (65 mph)
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.
- Railroad overpass:	23.0 ft.

Table 21 – Design Controls for I-10 Local Lanes

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed:	50 mph
Superelevation:	0.06 ft/ft maximum
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Left shoulder:	4 ft., plus 2 ft. offset to barrier
- Right shoulder:	10 ft., plus 2 ft. offset to barrier
Maximum Horizontal Curve:	6 degree, 53 minutes
Maximum Gradient:	Not applicable, match existing
Taper Rate:	50:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

I-17 is classified as a controlled access Urban Principal Arterial-Interstate. A summary of the design controls for I-17 is provided in Table 22.

Table 22 – Design Controls for I-17

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed (Existing):	60 mph
Superelevation:	0.06 ft/ft maximum
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Median:	12 ft.
- Outside:	12 ft.
HOV Buffer Width:	N/A
Maximum Horizontal Curve:	4 degree, 18 minutes
Maximum Gradient:	Not applicable, match existing
Taper Rate:	60:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

A summary of the design controls for the I-17 frontage roadways is provided in Table 23

Table 23 – Design Controls for I-17 Frontage Roads

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed:	40 mph
Superelevation:	0.04 ft/ft maximum
Pavement Width:	16 ft. minimum
Lane Width:	12 ft.
Maximum Horizontal Curve:	11 degree, 49 minute
Maximum Gradient:	+4%, -5%, +/- 3% at crossroad
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

US 60 is classified as a controlled access Urban Principal Arterial-Other Freeway. A summary of the design controls for US 60 is provided in Table 24.

Table 24 – Design Controls for US 60

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed (Existing):	Match existing (60 mph)
Superelevation:	Match existing (0.06 ft/ft maximum)
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Median:	10 ft.
- Outside:	12 ft.
HOV Buffer Width:	N/A
Maximum Horizontal Curve:	4 degree, 18 minutes
Maximum Gradient:	Not applicable, match existing
Taper Rate:	60:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

SR 143 is classified as a controlled access Urban Principal Arterial-Other Freeway. A summary of the design controls for SR 143 is provided in Table 25.

Table 25 – Design Controls for SR 143

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed (Existing):	Match existing (60 mph)
Superelevation:	Match existing (0.06 ft/ft maximum)
Cross Slope:	2.0%
Lane Width:	12 ft.
Shoulder Width:	
- Median:	4 ft. (MP 0.25 to MP 1.10) 10 ft. (MP 1.10 to MP 1.42)
- Outside:	12 ft.
Maximum Horizontal Curve:	4 degree, 18 minutes
Maximum Gradient:	Not applicable, match existing
Taper Rate:	60:1
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

A summary of the design controls for the system interchange ramps, and “express to local lanes” transfer ramps (and vice versa) is provided in Table 26.

Table 26 – Design Controls for System Interchange Ramps and Transfer Ramps

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed:	
- To Express Lanes:	55 mph
- To Local Lanes:	50 mph
Superelevation:	Match Existing (0.06 ft/ft maximum)
Cross Slope:	2.0%
Pavement Width:	
- Single lane ramps:	28 ft.
- Two lane ramps:	36 ft., plus 2 ft. offset to barrier
- Three lane ramps:	48 ft., plus 2 ft. offset to barrier
Lane Width:	12 ft.
Shoulder Width:	
- Inside shoulder:	4 ft., plus 2 ft. offset to barrier
- Outside shoulder:	8 ft., plus 2 ft. offset to barrier
Maximum Horizontal Curvature:	5 degree, 24 minute
Maximum Gradient:	+4%, -5%
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

A summary of design controls for the service interchange ramps is provided in Table 27.

Table 27 – Design Controls for Service Interchange Ramps

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Design Year:	2030
Design Speed:	
- Nose of gore (exit ramps):	50 mph (with Local Lanes) 55 mph (with Express Lanes)
- Nose of gore (entrance ramps):	45 mph (with Local Lanes) 50 mph (with Express Lanes)
- Ramp body:	45 mph
- Ramp terminal:	35 mph
Superelevation:	0.06 ft/ft maximum
Pavement Width:	
- Single lane exit ramp:	22 ft., plus 2 ft. offset to barrier
- Two lane exit ramp:	34 ft., plus 2 ft. offset to barrier
- Entrance ramp:	28 ft., plus 2 ft. offset to barrier

Table 27 – Design Controls for Service Interchange Ramps (continued)

DESCRIPTION OF CRITERIA	VALUES FOR DESIGN
Lane Width:	12 ft.
Maximum Horizontal Curve:	6 degree, 53 minute
Maximum Gradient:	+4%, -5%, +/- 3% at crossroad
Slope Standards:	
- Cut slopes:	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum
Minimum Vertical Clearance:	
- Highway structure:	16.5 ft.
- Pedestrian overpass:	17.5 ft.

The local arterial streets will be designed in accordance with the local jurisdiction functional classification requirements.

3.3 GENERAL DRAINAGE SYSTEM MODIFICATIONS

This section includes a general overview of the proposed modifications to the drainage systems necessary to support the proposed roadway improvements. A graphic depiction is provided with Figure 12 shown on page 94.

3.3.1 Offsite Drainage Systems

Segment 1

The proposed modifications will be discussed later in the Onsite Drainage Systems section.

Segment 2

The Tempe Drain is currently an open channel between 52nd Street and the Salt River, except where it passes under 32nd Street through a multi-barrel culvert. Under the proposed condition, the westbound local lanes would encroach into the Tempe Drain outfall channel between Station 7969+00 and Station 7957+00. As a result, the existing riprap line outfall channel would be converted to four barrel 12'x9' RCBC between 32nd Street and the Salt River.

An Intergovernmental Agreement (IGA) between the Arizona Department of Transportation (ADOT), the City of Tempe, the City of Phoenix, the Salt River Valley Water Users Association (SRVWUA), the Salt River Project Agricultural Improvement and Power District (SRP), and the Flood Control District of Maricopa County (FCDMC) was developed in 1989 to designate discharges to the Tempe Drain from each participant. In order to accommodate the widening of I-10, all parties are considering an amendment to the IGA that would allow ADOT to use the current design discharge of the City of Phoenix's 48th Street storm drain as part of ADOT's discharge allotment into the Tempe Drain at 48th Street. In return, the 48th Street storm drain would connect to a new ADOT drainage trunk line planned along the south side of I-10 between 48th Street and the Salt River. All parties have agreed in principle to the IGA amendment.

Some existing offsite drainage improvements would be relocated because the new roadways would be placed over existing area drain catch basins or roadside ditches. The new ditches and inlets would be placed adjacent to the new and widened roadways. Extensions of the lateral storm drain pipes that discharge into the roadside ditches would also be coordinated with the proposed improvements.

Segment 3

The existing cross culverts under I-10 would be extended to accommodate the widened roadways.

3.3.2 Onsite Drainage Systems

Segment 1

The proposed roadway improvements west of 7th Street would include the reconstruction of portions of I-17 to raise the profile to provide the vertical clearances over the crossroads. However, the additional drainage areas contributing to the storm drain system would be minor resulting in a slight increase to the peak discharge contributing to the 3rd Street storm drain. In order to attenuate the peak discharge, online detention vaults may be considered with the storm drain design. If the new peak discharge values can be decreased to existing levels, the existing drainage infrastructure would be utilized with minor modifications.

The increase in peak discharge to the 11th Street cross culvert would be approximately 13 cfs. A preliminary hydraulic analysis indicates the 100-year headwater elevation would be approximately 6" below the frontage road.

The improvements to I-17 would significantly widen the pavement contributing to the 16th Street storm drains. Since the 16th Street storm drains are currently flowing full under the existing conditions, additional runoff from the widened roadway would be required to be mitigated by new retention/detention basins located within the I-10/I-17 TI infield areas, retention/detention basins located within remnant parcels, or the construction of a new storm drain in 16th Street between I-17 and the Salt River.

The proposed improvements to I-10 between Roosevelt Street and the I-10/I-17 TI will primarily impact the Mohave Street and Buckeye Road drop structures to the east tunnel. The additional roadway pavement that contributes to the Mohave Street drop structure would increase the peak discharge by approximately 16 cfs during the 10-year storm event. The increase in runoff to the drop structure could be mitigated by adding a new detention basin in the northeast quadrant of the I-10/I-17 TI.

The proposed improvements would increase the peak discharge to the Buckeye Road drop structure by approximately 2 cfs during the 10-year storm event. This amount should be mitigated by enlarging an existing basin near the drop structure.

Between 24th Street and the Salt River, the proposed roadway improvements will cover a portion of the existing open channel on the north side of I-10. A new storm drain would be placed along

the westbound local lanes between Stations 7905+00 and 7923+00. The closed conduit would transition to an open channel wherever sufficient right-of-way would become available along the airport.

Since the Salt River Bridge would be modified with this project, changes to the existing deck drains would be required. The new local lane bridge will include deck drains that will discharge into the Salt River.

Segment 2

To accommodate the additional runoff from the express and local lanes, a new trunk line is proposed along the south side of I-10 between 48th Street and the Salt River. A connection would be provided to the existing 48th Street storm drain that extends to the north of Broadway Road.

The existing trunk line is located on the north side of I-10 would be used for the westbound express and local lanes. The new south trunk line would be used for the eastbound express and local lanes.

The required capacity of the trunk lines was estimated by determining the difference in peak discharge under the proposed condition and the capacity of the adjacent existing trunk line as shown in Table 28.

Table 28 – Proposed Storm Drain Pipe Capacity

Description	Size (in)	Slope (ft/ft)	Pipe Full Capacity (cfs)
North Trunk Line; 48th Street to 44th Street	36	0.0033	38
North Trunk Line; 44th Street to 40th Street	36	0.0033	38
North Trunk Line; 40th Street to 36th Street	42	0.0033	58
North Trunk Line, 36th Street to Tempe Drain	48	0.0033	83
South Trunk Line; Tempe Butte to Alameda Drive	36	0.0050	47
South Trunk Line; Basin 2B to Alameda Drive	48	0.0040	91
Trunk Line crossing at Alameda Drive	60	0.0020	117
South Trunk Line; Tempe Butte to Broadway Road	30	0.0200	58
South Trunk Line; Broadway Road to 48th Street	66	0.0020	150
South Trunk Line; 48th Street to 44th Street	66	0.0033	193
South Trunk Line; 44th Street to 40th Street	102	0.0015	415
South Trunk Line; 40th Street to 36th Street	102	0.0015	415
South Trunk Line; 36th Street to 32nd Street	102	0.0015	415
South Trunk Line; 32nd Street to Salt River	102	0.0015	415

There are several existing detention basins near 48th Street that currently attenuate runoff. The proposed roadway improvements may eliminate many of these basins, which would require the proposed south trunk line to be designed to accommodate runoff in excess of the existing trunk line capacity.

The increased runoff generated between 48th Street and Guadalupe Road would be routed through the existing basins at the I-10/US60 TI and the I-10/SR143 TI. Since the capacity of the basins would be reduced the capacity of the system must be increased by installing additional outlet pipes or enlarging existing outlet pipes. A larger peak discharge would be conveyed to the Tempe Drain (at 48th Street) from this drainage system. The proposed modification to the Tempe Drain IGA would accommodate the increased discharge rates to the Tempe Drain.

A new trunk line would be constructed along the westbound local lanes between the I-10/US60 TI at the existing Basin ‘E’ (east of I-10 and south of Baseline Road). The new trunk line would convey runoff from the westbound express and local lanes. The existing trunk line, currently located along the outside shoulder of the westbound roadway, would convey runoff collected from the eastbound express and local lanes. Both trunk lines would discharge into Basin ‘E’.

The additional trunk line would cause an increase in the volume of water that discharges into Basin ‘E’. The volume of Basin ‘E’ could be increased to accommodate the increased discharges. There appears to be ample space for expansion of Basin ‘E’, although extensive rock excavation would be necessary.

Some small detention basins along SR 143 between 12th Street and the Tempe Drain, may also be removed by the proposed roadways. A new storm drain would need to be installed to collect this runoff from the eastern right-of-way and for conveyance to the Tempe Drain.

Segment 3

Since the additional pavement area is small relative to the existing roadway widths, the onsite runoff is anticipated to increase by less than 3% with the proposed improvements. The impact of such a small increase upon the combined offsite and onsite runoff that cross and discharge from the corridor is relatively insignificant.

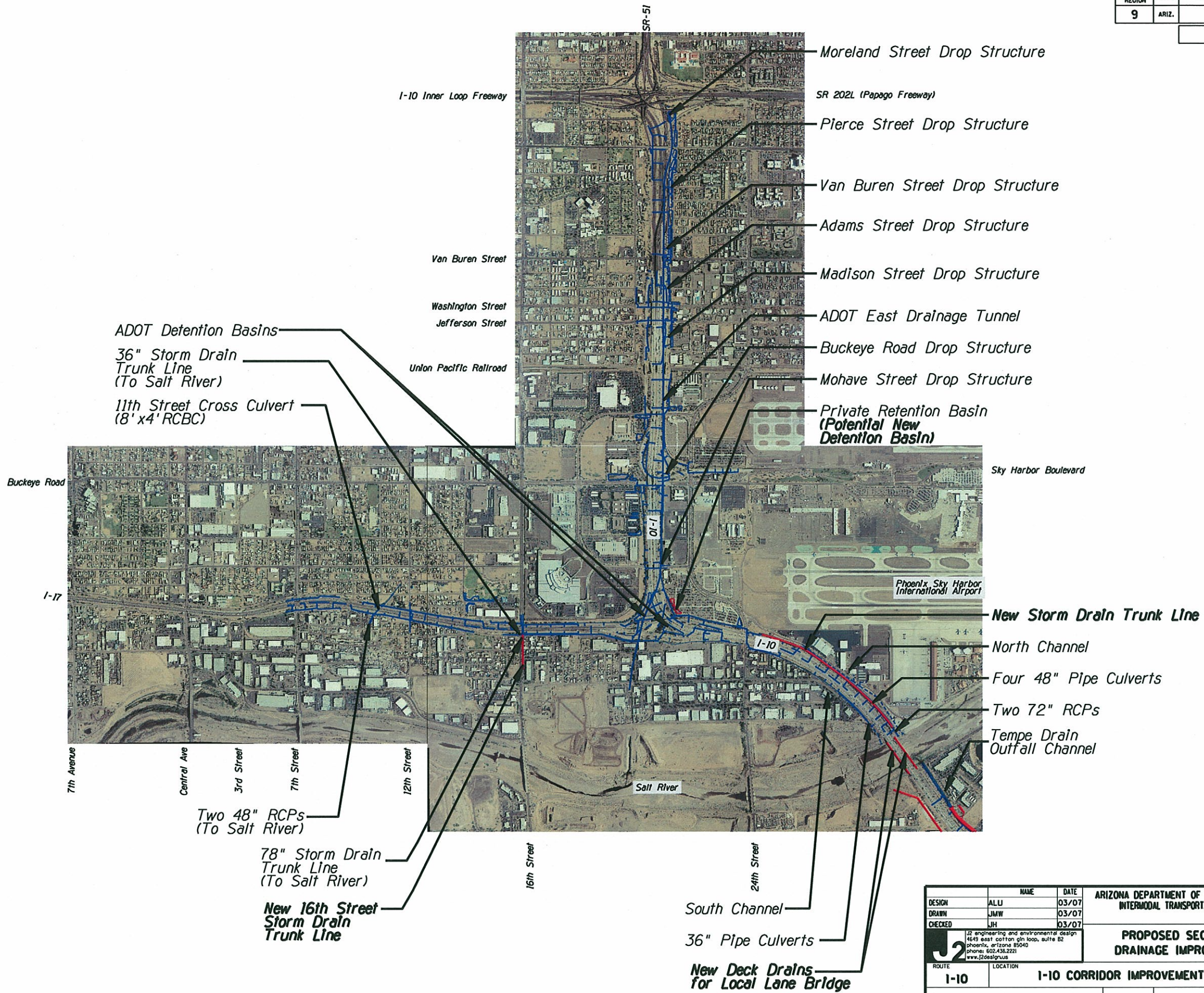
The pavement widening would remove a few of the existing retention basins adjacent to the freeway. In order to preserve and optimize the storage volume in the remaining onsite storage basins, short retaining walls are proposed along the roadway shoulder. The use of retaining walls could increase the onsite storage volume in the basins from approximately 13.7 acre-feet to approximately 34.7 acre-feet, providing sufficient storage for approximately the 100-year, 6-hour storm event.

ADOT C-15.92 inlets with storm drain pipes, or openings in the concrete half barrier (rectangular holes approximately 1’ long and 3” high) were two of the options that were considered to collect and convey pavement runoff to the retention basins. Each design alternative was reviewed by ADOT drainage and maintenance personnel, and the ADOT C-15.92 inlets with slotted drain have been initially selected as the preferred alternative.

[Text resumes on page 97]

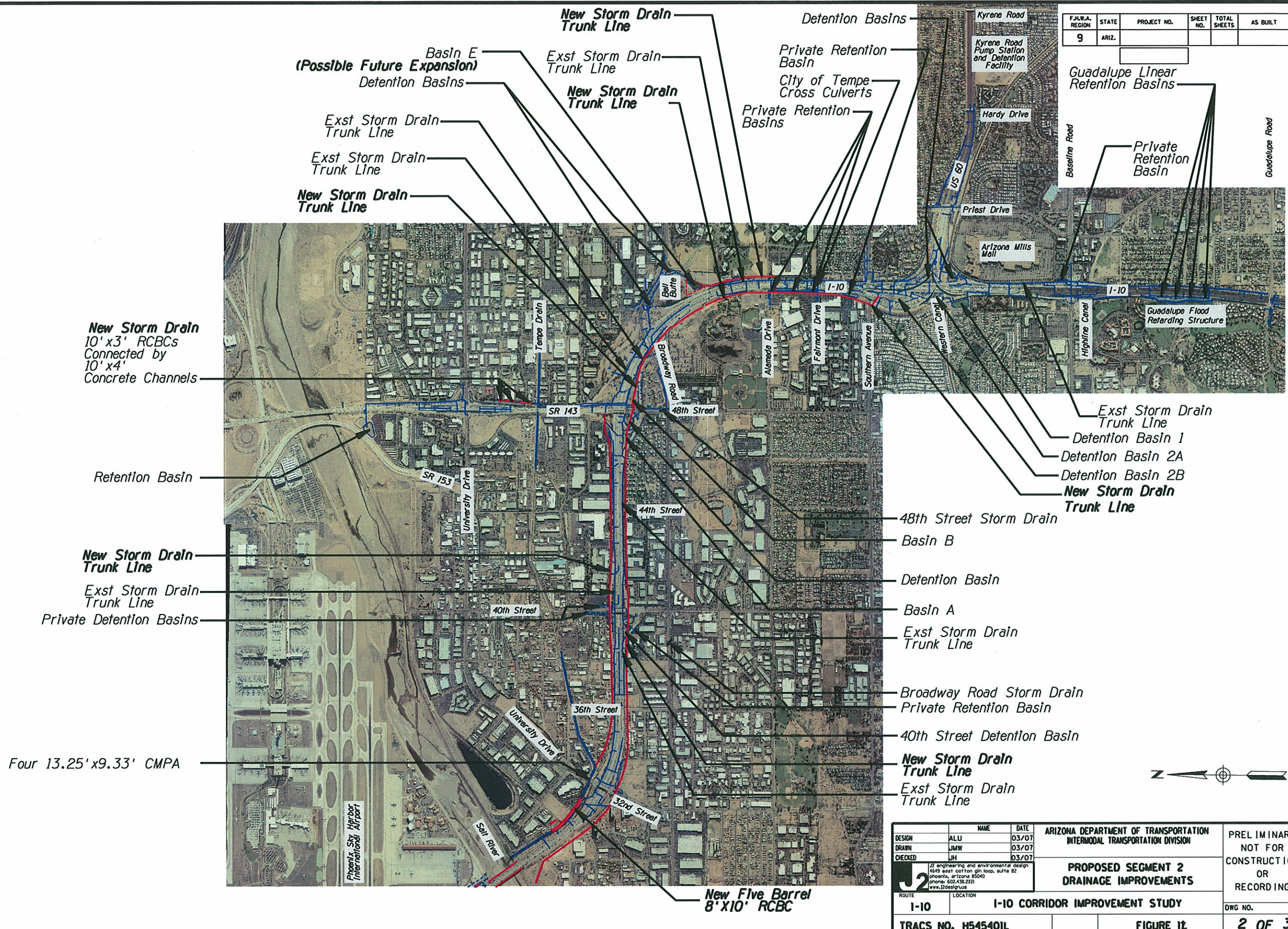
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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				



DESIGN	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION	PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING
DRAWN	ALU	03/07		
CHECKED	JH	03/07		
J2 engineering and environmental design 4649 east cotton gin loop, suite B2 phoenix, arizona 85040 phone: 602-438-2221 www.j2design.com			PROPOSED SEGMENT I DRAINAGE IMPROVEMENTS	
ROUTE	LOCATION	1-10 CORRIDOR IMPROVEMENT STUDY		
1-10				
TRACS NO. H54540IL			FIGURE 12	DWG NO. 1 OF 3

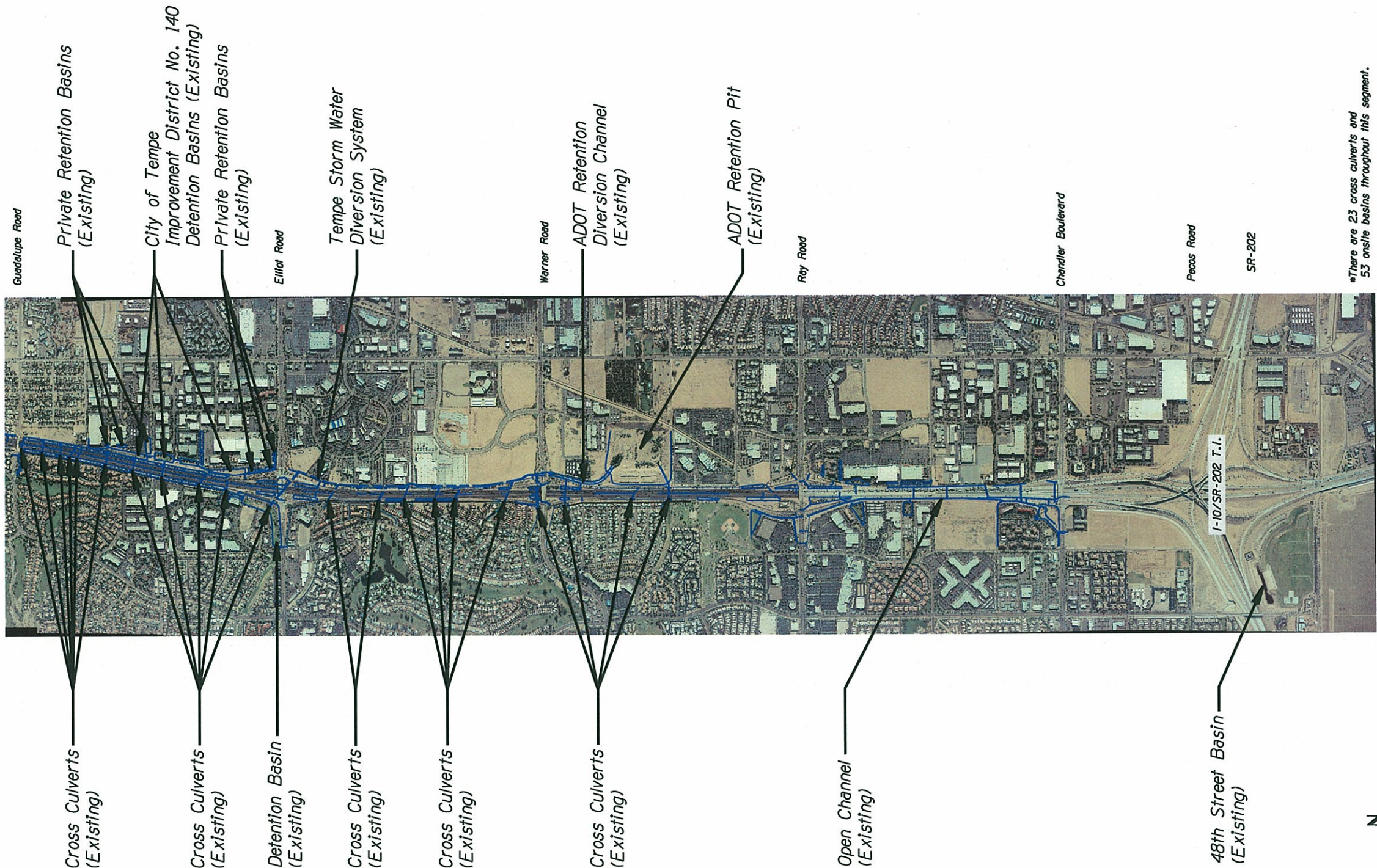
DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO. DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO.



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION	PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING
DESIGN		ALU	03/07		
DRAWN		JMW	03/07		
CHECKED		JH	03/07		
J2 J2 engineering and environmental design 4649 east cotton gin loop, suite B2 phoenix, arizona 85040 phone: 602.435.2221 www.j2design.us		PROPOSED SEGMENT 2 DRAINAGE IMPROVEMENTS			
ROUTE		LOCATION			
I-10		I-10 CORRIDOR IMPROVEMENT STUDY			DWG NO.
TRACS NO. H545401L			FIGURE 11		<u>2 OF 3</u>

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				



		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION	PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING	
DESIGN	ALU		03/07			
DRAWN	JMW		03/07			
CHECKED	JH		03/07			
<div>J2 engineering and environmental design 4649 east cotton gin loop, suite B2 Phoenix, Arizona 85040 phone: 602.438.2221 www.j2designus.com</div>				PROPOSED SEGMENT 3 DRAINAGE IMPROVEMENTS		
ROUTE		LOCATION				
I-10		I-10 CORRIDOR IMPROVEMENT STUDY				
DWG NO.						
TRACS NO. H545401L			FIGURE 12		<u>3 OF 3</u>	

3.4 I-10 WIDENING ALTERNATIVES

3.4.1 Introduction

Alternative freeway widening concepts were developed for I-10 based on the features required to meet the operational goals for the projected traffic volumes and anticipated travel patterns.

Consideration was given to the I-10 express and local lane, system interchange and service interchange ramp operations and geometric design requirements; right-of-way impacts; environmental impacts and mitigation requirements; conformance with regional transportation plans; and project costs.

No modifications are proposed to the existing horizontal alignments of I-10, I-17, SR 143 and US 60. Each alternative would retain the existing HOV lanes to encourage carpooling and support the existing and planned Bus Rapid Transit (BRT) and express bus routes that use the HOV lanes.

3.4.2 No-Build Alternative 1

The No-Build Alternative would not result in any of the improvements identified in the RTP. The congested freeway conditions currently being experienced during the peak travel periods would be expected to worsen on I-10, I-17, SR 143, US 60 and the local arterial street system as the traffic demand continues to grow in the future.

This alternative would not achieve the goal of providing sufficient capacity for the HOV lanes to encourage carpooling and support the existing and planned Bus Rapid Transit (BRT) and express bus routes. The planned future HOV directional ramp connection between I-10 (east of the I-10/I-17 TI) and I-17 (west of the I-10/I-17 TI) would not be provided in accordance with the regional HOV system plan.

This alternative would also retain the current configuration of the I-10/SR 143 TI with the existing loop ramp for traffic on southbound SR 143 that are destined for eastbound I-10. The existing signalized intersection would also remain for the freeway-to-freeway and local movements between I-10, SR 143, 48th Street and Broadway Road.

Based on the evaluation of the operational performance of the existing roadway configuration with the 2030 traffic volume projections, the No-Build alternative has been determined to be inadequate and was eliminated from further consideration.

3.4.3 Alternative 1 (1988 Express/Local Lanes Concept)

Alternative Overview

This concept would provide independent roadways to separate regional traffic (on the express lanes) from local traffic (on the local lanes), thereby eliminating the current weaving maneuvers that contribute to congestion throughout the corridor. The ramp connections to SR 143 and the local arterial street interchanges would enter and exit the freeway system from the local lanes,

allowing travelers in the express lanes to pass through the corridor more efficiently. Conversely, travelers on the local lanes would not conflict with the high volume of regional traffic traveling through this segment of the I-10 corridor each day. The roadway concept plans, Year 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are shown in Appendix C.

A limited number of transfer ramp connections would be provided between the express lanes and local lanes to retain local access but reduce the number of conflict points on the express lanes.

Eastbound Express Lanes

Three general-purpose lanes and one HOV lane would be provided on I-10 approaching Buckeye Road. The initial "express to local lanes" exit ramp would occur near Buckeye Road and would be developed as a mandatory exit from the outside freeway lane, with the second lane designed as an optional lane with the freeway through movement. Two express lanes and one HOV lane would continue to the east on I-10 through the I-10/I-17 TI. The ramp from eastbound (southbound) I-10 to northbound (westbound) I-17 (Ramp S-W) would be developed as a single-lane ramp with a tapered exit configuration.

Three general-purpose lanes would be provided on I-17 approaching the I-10/I-17 TI. The ramp from southbound (eastbound) I-17 to westbound (northbound) I-10 (Ramp E-N) would be developed as a single-lane ramp with a tapered exit configuration. The "express to local lanes" transfer ramp from southbound (eastbound) I-17 to the eastbound local lanes would also be developed as a single-lane ramp with a tapered exit configuration.

East of the I-10/I-17 TI, five express lanes and one HOV lane would continue to the east between 24th Street and 32nd Street. The 24th Street entrance ramp would be designed as a single lane ramp with a tapered entrance configuration. Just west of 32nd Street, an "express to local lanes" transfer ramp (2 lanes) would be developed as a mandatory exit from the outside express lane, with the second lane designed as an optional lane with the freeway through movement. Four express lanes and one HOV lane would continue to the east to the I-10/US60 TI.

Four express lanes and one HOV lane would be provided on I-10 approaching the I-10/US60 TI. The ramp from the I-10 express lanes to eastbound US 60 (Ramp S-E)(3 lanes) would be developed as a mandatory exit from the two outside express lanes, with the third lane designed as an optional lane with the I-10 through movement. Two express lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp (1 lane) would be developed with a tapered exit configuration.

The eastbound local lanes would merge into the express lanes immediately south of the I-10/US60 TI with a "lane-add" configuration to develop four express lanes and one HOV lane that continue to the south. The ramp from westbound US 60 to eastbound (southbound) I-10 (Ramp W-S), and the Baseline Road entrance ramp, would merge with the express lanes with successive single-lane entrance ramps with tapered entrance configurations.

No additional improvements would be provided on I-10 or I-17 outside of the limits of the local lanes.

Eastbound Local Lanes:

Upon departing the I-10 express lanes near Buckeye Road, the new local lanes (2 lanes) roadway would rise over the existing I-10/I-17 TI on a new bridge and continue to the east parallel to the express lanes. The Buckeye Road entrance ramp would be realigned to connect with the local lanes with a tapered entrance configuration.

An “express to local lanes” transfer ramp (1 lane) from I-17 would merge with the local lanes with a tapered “left-entrance” configuration to develop a two lane roadway near 24th Street that continues to 32nd Street. New bridge structures would be provided at 24th Street and the Salt River.

Two local lanes would continue to the east of 32nd Street and merge with the “express to local lanes” transfer ramp (2 lanes) to develop four local lanes. The outside local lane would terminate prior to the 32nd Street entrance ramp gore to provide three local lanes between 32nd and 40th Streets.

The 32nd Street TI south ramps would be designed with a diamond interchange configuration, with tapered exit and entrance ramp connections to the local lanes. The existing 32nd Street bridge would be removed and replaced with a new structure with the spans necessary to support the local lanes.

The 40th Street TI south ramps would be designed with a partial cloverleaf interchange configuration with ramp connections to the local lanes. The eastbound exit ramp (2 lanes) would be developed as a mandatory exit from the outside lane, and the second lane designed as an optional lane with the through movement. The loop ramp would be developed with a parallel entrance configuration that transitions into an additional local lane that would continue to the east. The eastbound entrance ramp would be designed with a tapered entrance configuration.

The I-10/SR143 TI would be reconfigured to provide a fully directional system interchange with ramp connections to the local lanes. A new directional ramp (2 lanes) would be provided for the southbound SR 143 to eastbound I-10 traffic movement (Ramp S-E) that would replace the existing loop ramp. A new directional ramp (1 lane) would also be provided from the eastbound I-10 to northbound SR 143 (Ramp E-N) traffic movement that would replace the 48th Street signalized intersection. The eastbound I-10 exit ramp to 48th Street would be eliminated with this alternative.

The Ramp E-N exit would be developed as a single-lane exit with a tapered “left-exit” configuration. East of Ramp E-N, the Broadway Road exit (2 lanes) would be developed as a mandatory exit from the outside lane, and the second lane designed as an optional lane with the through movement. Two local lanes would continue to the east through the system interchange.

The southbound SR 143 to eastbound I-10 (Ramp S-E) directional ramp would depart the SR 143 mainline as a two-lane bifurcation from the inside lanes, and then merge with the eastbound local lanes in the vicinity of Broadway Road. This directional ramp (2 lanes) would merge with the local lanes (2 lanes) to develop a four lane roadway. The outside local lane would terminate prior to the

Broadway Road entrance ramp gore to provide three local lanes between Broadway Road and US 60.

The Broadway Road TI west ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The Broadway Road entrance ramp would merge with the local lanes with a tapered entrance configuration. Broadway Road would be realigned in the vicinity of I-10. A new bridge would be constructed over I-10 to provide the spans needed to support the local lanes.

Access along SR 143 between University Drive and Broadway Road would be provided with new northbound and southbound connector roads (2 lanes) between the 48th Street/Broadway Road intersection and the SR143/University Drive TI. The existing SR 143 bridge over I-10 would be removed from service.

A “local to express lanes” transfer ramp would be provided between the eastbound local lanes and the eastbound US 60 directional ramp (Ramp S-E) in the vicinity of Southern Avenue. The transfer ramp (1 lane) would depart the local lanes with a tapered “left-exit” configuration, and then merge with Ramp S-E (3 lanes) to develop four lanes that continue to the east on US 60. New bridges would be provided for the eastbound local lanes and the transfer ramp over Southern Avenue.

Three lanes would continue to the south on the eastbound local lanes between US 60 and the I-10 entrance ramp. The local lanes (3 lanes) would merge with the eastbound express lanes (2 lanes) to develop five general-purpose lanes and one HOV lane. The outside lane would terminate to provide four general-purpose lanes and one HOV lane that continue to the south.

Westbound Express Lanes

Four general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial “express to local lanes” exit ramp to the westbound local lanes (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp (1 lane) would be developed with a tapered exit configuration from the outside lane. The “express to local lanes” exit (2 lanes) would be developed as a mandatory exit from the outside freeway lane, with the second lane designed as an optional lane with the freeway through movement.

Three express lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second “express to local lanes” transfer ramp would be developed immediately south of US 60 to provide an additional connection to the local lanes. The transfer ramp would be developed as a mandatory exit from the outside express lane, with the second lane designed as an optional lane with the freeway through movement. Two express lanes and one HOV lane would continue to the north through the I-10/US60 TI.

North of the I-10/US60 TI, three general-purpose lanes and one HOV lane from westbound US 60 would enter the express lanes to develop five express lanes and one HOV lane departing the system interchange. A new bridge would be constructed on Ramp N-W over the local lanes.

Another “express to local lanes” transfer ramp (2 lanes) would be provided near Broadway Road that would be developed as a mandatory exit from the outside express lane, with the second lane designed as an optional lane with the freeway through movement. Four express lanes and one HOV lane would continue to the west to 32nd Street.

A “local to express lanes” transfer ramp (2 lanes) would be provided near 32nd Street. The transfer ramp would merge with the express lanes (4 lanes) to develop six express lanes and one HOV lane. The outside express lane would terminate south of the Salt River bridge to provide five express lanes and one HOV lane approaching the I-10/I-17 TI. The 24th Street exit ramp would be developed as a single lane ramp with a tapered exit configuration.

Five express lanes and one HOV lane would be provided on the westbound I-10 approaching the I-10/I-17 TI. The express lanes would bifurcate with three express lanes and one HOV lane continuing to the north on I-10, and three lanes continuing to the west on I-17. The middle express lane would be designed as an optional lane with access to either I-10 or I-17.

Ramp E-N (1 lane) would merge into the express lanes north of I-17 with a tapered entrance configuration. The “local to express lanes” transfer ramp (1 lane) would also merge into the westbound express lanes with a parallel entrance configuration. Three general-purpose lanes and one HOV lane would continue to the north on I-10.

Another “local to express lanes” transfer ramp (1 lane) would provide a connection from the westbound local lanes to I-17 with a tapered entrance configuration. Ramp S-W would also enter westbound I-17 with a tapered entrance configuration. Three general-purpose lanes would continue to the west on I-17 in the vicinity of 16th Street.

No additional improvements would be provided on I-10 or I-17 outside of the limits of the local lanes.

Westbound Local Lanes

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp N-E), would depart I-10 just south of Baseline Road. The existing “express to local lanes” exit ramp would remain as a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the freeway through movement. The westbound local lanes (2 lanes) would continue to the north immediately east of the express lanes. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration and transition into an auxiliary lane that continues to Ramp N-E. Ramp N-E (1 lane) would be developed as a mandatory exit from the auxiliary lane, and two local lanes would continue to the north.

A second “express to local lanes” transfer ramp (2 lanes) would be provided just south of US 60. The transfer ramp would merge with the local lanes with a “lane-add” configuration. The outside lane would terminate to develop three lanes approaching Southern Avenue. The ramp from westbound US 60 to the local lanes (2 lanes transitioning to 1 lane) would be developed as a mandatory exit from the outside general-purpose lane, and the second lane

designed as an optional lane with Ramp W-N. Three lanes would continue to the west on Ramp W-N to I-10.

The three local lanes on I-10 (from the south) would merge with the ramp from westbound US 60 (1 lane) to develop four lanes immediately downstream of the I-10/US60 TI. The outside lane would terminate near Southern Avenue to develop three local lanes approaching the I-10/SR143 TI. A new bridge would be provided for the local lanes over Southern Avenue.

The Broadway Road TI east ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The Broadway Road entrance and exit ramps would be developed with tapered exit configurations.

The westbound I-10 to northbound SR 143 (Ramp W-N) directional ramp (2 lanes) would be developed as a mandatory exit from the outside lane, with the second lane designed as an optional lane with the through movement to the west.

The “express to local lanes” transfer ramp at Broadway Road (2 lanes) would merge with the local lanes (2 lanes) to develop a four lane roadway. The outside local lane would terminate prior to the Ramp S-W gore to develop a three lane roadway that continues to the west to the 40th Street exit ramp. The southbound SR 143 to westbound I-10 (Ramp S-W) directional ramp (1 lane) would enter the westbound local lanes with a tapered entrance configuration.

The 40th Street north ramps would be designed with a partial cloverleaf configuration with exit and entrance ramp connections to the local lanes. The westbound exit ramp (1 lane) would be developed as a mandatory exit from the outside lane. The loop ramp would be designed with a parallel entrance configuration that transitions into an additional local lane. The westbound entrance ramp would be realigned with a tapered entrance configuration.

The 32nd Street TI north ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The exit ramp (1 lane) would be designed with a tapered exit configuration. A westbound “local to express lanes” transfer ramp would be provided near 32nd Street. The transfer ramp (2 lanes) would be developed as a mandatory “left-exit” from the inside lane, and the second lane designed as an optional lane with the through movement. Two local lanes would continue to the west. The 32nd Street entrance ramp would be designed with a tapered entrance configuration to provide two local lanes approaching the I-10/I-17 TI. New bridges would be provided over the Salt River and 24th Street.

The two local lanes would continue to the west (to I-10) and transition into a single-lane entrance ramp with the express lanes near Buckeye Road. The Buckeye Road exit ramp would be designed as a single-lane ramp with a tapered exit configuration. A new bridge would be provided over Mohave Street.

A “local to express lanes” transfer ramp (1 lane) would provide a connection between the local lanes and westbound I-17. The transfer ramp would be developed with a tapered “left-exit” configuration.

Advantages and Disadvantages:

The advantages of the Alternative 1 Express/Local Lanes concept are as follows:

- Less land area (59 acres) would be required when compared with the other alternatives, resulting in potential impacts to 54 businesses and 240 residences with an estimated cost of \$207 million.
- Lower estimated construction cost (\$765 million).
- The express lanes would operate with LOS 'D' or better within the limits of the local lanes. However, the acceptable operational performance is caused by the "bottlenecks" created by the reduced number of express lanes at the I-10/I-17 TI and the I-10/US60 TI.
- An additional 68,000 vpd (388,000 vpd total) would travel through the Broadway Curve when compared with the No-Build alternative.

The Disadvantages of the Alternative 1 Express/Local Lanes concept are as follows:

- This alternative would not incorporate current ADOT design practice for 1.) lane balance for the development of additional lanes in advance of a system interchange, 2.) minimum number of lanes through a system interchange, 3.) method of terminating lanes departing a system interchange, and 4.) providing auxiliary lanes between service interchange entrance and exit ramps.
- The number of express lanes on I-10 would be reduced from 3 lanes to 2 lanes at the I-10/I-17 TI and the I-10/US60 TI, which will minimally benefit the freeway capacity for the segments of I-10 between SR 51 and I-17, and between US 60 and the Santan Freeway.
- The configuration of the westbound express lanes approaching to the I-10/I-17 TI (and eastbound approaching the I-10/US60 TI) would require travelers in an optional lane make a decision to either continue to I-10, or to I-17, at the freeway bifurcation. This situation has previously resulted in driver confusion that results in reduced freeway capacity and a higher potential for accidents.
- The development of the entrance and exit transfer ramp connections with I-10, I-17 and US 60 at the north and south limits of the local lanes would not conform to current ADOT design practice for lane continuity and operational efficiency. Traffic congestion would be expected to occur at these locations.
- One HOV lane would be provided in each direction of travel on I-10 between I-17 and US 60. This configuration would not provide sufficient capacity for the projected HOV travel demand.
- A potential future HOV directional ramp connection would not be provided between I-10 (east of the I-10/I-17 TI) and I-17 (west of the I-10/I-17 TI) in accordance with the adopted transportation planning documents.

3.4.4 Alternative 2 (Express/Local Lanes Concept)

Alternative Overview:

Alternative 2 was developed to update the Alternative 1 Express/Local Lanes concept to provide the additional capacity needed for the projected 2030 traffic demand, and to conform to current geometric design criteria and design practice. This alternative was also updated to include improvements that are included in regional planning documents and identified in the RTP. The

roadway concept plans, Year 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are included in Appendix C.

The study limits were extended on I-10 to Roosevelt Street on the north and Chandler Boulevard on the south. The limits of the local lanes were retained at Buckeye and Baseline Roads. At the north and south limits of the local lanes, the development of the entrance and exit ramp connections with I-10, I-17, SR 143 and US 60 were modified to conform with current ADOT methodology for lane continuity.

One lane was generally added in each direction of travel to the I-10 express lanes throughout the study area. This additional lane eliminated the existing "lane-drops" that are currently causing congestion on I-10 during the peak travel periods.

One additional lane was also generally added to the local lanes, and the "express to local lanes" and "local to express lanes" transfer ramps were reconfigured to provide two lane ramps at all locations.

A potential future HOV directional ramp connection between I-10 (east of the I-10/I-17 TI) and I-17 (west of the I-10/I-17 TI) was included in this alternative. One HOV lane would also be provided on I-10 in each direction of travel between SR51 and I-17, two HOV lanes in each direction of travel between I-17 and US60, and one HOV lane continuing in each direction of travel on I-10 between US 60 and the Santan Freeway.

Eastbound Express Lanes:

South of the I-10/SR51/SR202L TI, an additional general-purpose lane would be provided on I-10 by extending the SR 51 southbound entrance ramp (2 lanes) to the Washington/Jefferson Street TI exit ramp. The Washington/Jefferson Street exit ramp (2 lanes) would be developed with a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the I-10 through movement. Four general-purpose lanes and one HOV lane would continue to the south.

The Washington/Jefferson Street TI entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that would continue to the Sky Harbor Boulevard exit ramp. The Sky Harbor Boulevard exit ramp (2 lanes) would be designed with a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-10 through movement. Four general-purpose lanes and one HOV lane would continue to the south to the initial eastbound local lanes exit ramp near Buckeye Road.

The existing overpasses would be widened at Van Buren Street, the Washington/Jefferson Street TI, UPRR, Sky Harbor Circle North, Buckeye Road and Mohave Street.

Traffic destined for the eastbound local lanes would depart I-10 near Buckeye Road. The eastbound "express to local lanes" exit ramp (2 lanes) would be designed as a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the I-10 through movement. Three express lanes and one HOV lane would continue to the south and

east on I-10 through the I-10/I-17 TI. The eastbound (southbound) I-10 to northbound (westbound) I-17 (Ramp S-W) directional ramp (1 lane) would depart I-10 with a parallel exit configuration.

Three general-purpose lanes are currently provided on I-17 in the eastbound direction of travel. One additional general-purpose lane and one HOV lane would be developed near 7th Avenue. The 7th Avenue entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the 7th Street exit ramp. The 7th Street exit ramp would be reconfigured to a single-lane ramp with a mandatory exit from the auxiliary lane.

The 7th Street entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane to provide five general-purpose lanes and one HOV lane approaching the I-10/I-17 TI. The 16th Street exit ramp would be developed as a single-lane ramp with a tapered exit configuration. The 7th Avenue, Central Avenue, 7th Street, UPRR Spur and 16th Street overpasses would be removed and replaced with new structures to support the required roadway widths and the vertical clearance over the arterial streets and the railroad. The existing eastbound I-17 structure over Ramp E-N would be widened approaching the “express to local lanes” transfer ramp.

The southbound (eastbound) I-17 to westbound (northbound) I-10 (Ramp E-N) directional ramp (1 lane) would be realigned to develop a mandatory exit from the outside general-purpose lane. East of Ramp E-N, the eastbound “express to local lanes” transfer ramp (2 lanes) would be developed with a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the I-17 through movement.

Three general-purpose lanes would continue on I-17 to the east and combine with the three express lanes on I-10 to develop six express lanes and two HOV lanes between 24th Street and 32nd Street. The 24th Street entrance ramp would be realigned with a parallel entrance configuration.

The eastbound and westbound express lanes would be realigned to develop the median width necessary for the planned future HOV directional ramp. New bridges would be provided over 24th Street to accommodate the new roadway alignments, roadway widths, and vertical clearance. The existing Salt River bridge would be widened to support the additional HOV and express lanes.

Another “express to local lanes” transfer ramp would occur near 32nd Street. The transfer ramp (2 lanes) would be developed with a mandatory exit from the outside express lane, and the second lane designed as an optional lane with the through movement. Five express lanes and two HOV lanes would continue to the east between 32nd Street and the I-10/US60 TI. No additional access would be provided between the express and local lanes between 32nd Street and US 60.

An additional express lane would be developed near Broadway Road to provide six express lanes and two HOV lanes approaching the I-10/US60 TI. Traffic on I-10 that is destined for eastbound US 60 (on Ramp S-E) would depart the express lanes with a three lane mandatory exit from the outside lanes. Three express lanes and one HOV lane would continue to the south on I-10 through the I-10/US60 TI. The Baseline Road exit ramp would be developed as a single-lane ramp

with a tapered exit configuration. HOV traffic that is destined for US 60 would exit I-10 at the existing HOV directional ramp.

A “local to express lanes” transfer ramp (2 lanes) would provide a connection between the eastbound local lanes and Ramp S-E in the vicinity of Southern Avenue. The transfer ramp would be developed with a mandatory “left-exit” configuration, and then merge with Ramp S-E (3 lanes) to develop five lanes that continue to the east on US 60. The existing Ramp S-E bridge over I-10 would be widened to provide the roadway width necessary to accept the additional lanes from the transfer ramp.

Two lanes would continue to the south on the eastbound local lanes between US 60 and the I-10 entrance ramp. The local lanes would merge with the eastbound express lanes south of the I-10/US60 TI to develop five express lanes and one HOV lane that continue to the south.

The westbound US 60 to southbound I-10 (Ramp W-S) directional ramp (1 lane) would merge with the Baseline Road exit ramp (1 lane) to develop a combined connector road (2 lanes) approaching the Baseline Road TI. The Baseline Road exit ramp (2 lanes) would depart the connector road with one lane as a mandatory exit from the outside lane, and the second lane designed as an optional lane with the Ramp W-S through movement to I-10. Ramp W-S would enter the I-10 mainline with a “lane-add” configuration to provide six express lanes and one HOV lane between Baseline Road and Elliot Road. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that would extend to Guadalupe Road. The Baseline Road overpass would be widened to support the added roadway width and ramp geometry.

The Elliot Road exit ramp (2 lanes) would be realigned with a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the I-10 through movement. Five general-purpose lanes and one HOV lane would continue to the south between Elliot Road and Warner Road. The Elliot Road entrance ramp would be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Warner Road exit ramp.

The Warner Road exit ramp (1 lane) would be realigned with a mandatory exit from the auxiliary lane. An AASHTO lane drop would occur to the south of the exit ramp to develop four general-purpose lanes and one HOV lane between Warner Road and Ray Road. The Warner Road entrance ramp be realigned with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Ray Road exit ramp.

The Ray Road exit ramp (1 lane) would be developed as a mandatory exit from the auxiliary lane. Four general-purpose lanes and one HOV lane would continue to the south to match into the existing I-10 mainline approaching the I-10/SR202L (Santan) TI.

South of US 60, the roadway widening on I-10 would be constructed within the existing right-of-way. The Guadalupe Road, Elliot Road, Warner Road and Ray Road underpasses were originally constructed with sufficient span lengths to support the roadway widening recommended with this alternative.

East of I-10, the US 60 eastbound roadway would be widened to develop five general-purpose lanes and one HOV lane between Priest Drive and the Mill Avenue exit ramp. The northbound I-10 to eastbound US 60 (Ramp N-E) directional ramp (1 lane), and the Priest Drive entrance ramp, would be realigned and merge with eastbound US 60 with parallel entrance configurations.

The Mill Avenue exit ramp would be realigned to provide a single-lane mandatory exit from the outside general-purpose lane. Four general-purpose lanes and one HOV lane were assumed to continue to the east on US 60 east of Mill Avenue.

Eastbound Local Lanes

Upon departing the I-10 express lanes near Buckeye Road, the local lanes (2 lanes) would rise over the existing I-10/I-17 TI on a new bridge and continue to the east parallel to the express lanes. The Buckeye Road entrance ramp would be realigned with a parallel entrance configuration.

An “express to local lanes” transfer ramp (2 lanes) from I-17 would merge with the local lanes with a “lane-add” configuration to develop a four lane roadway near 24th Street. The right lane would terminate north of the Salt River to provide three local lanes between the Salt River and the 32nd Street exit ramp. New bridge structures would be provided at 24th Street and the Salt River.

The 32nd Street TI south ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The 32nd Street exit ramp (1 lane) would be developed as a mandatory exit from the outside lane. Two local lanes would continue to the east and merge with the “express to local lanes” transfer ramp (2 lanes) to develop four lanes between 32nd Street and the 40th Street exit ramp. The 32nd Street entrance ramp would be designed with a parallel entrance configuration. The existing 32nd Street bridge would be removed and replaced to provide the spans needed to support the express and local lanes.

The 40th Street TI south ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The eastbound exit ramp (2 lanes) would be developed with a mandatory exit from the outside local lane, and the second lane designed as an optional lane with the through movement. The eastbound entrance ramp would be designed with a parallel entrance configuration that transitions into an auxiliary lane that continues to the I-10/SR143 TI Ramp E-N exit. The existing 40th Street bridge would be removed and replaced to provide the spans needed to support the express and local lanes.

The I-10/SR143 TI would be reconstructed to provide a fully directional freeway-to-freeway system interchange, with directional ramp connections with the local lanes. A new directional ramp (2 lanes) would be provided to replace the existing loop ramp for the southbound SR 143 to eastbound I-10 (Ramp S-E) traffic movement. A directional ramp (1 lane) would also be provided for the eastbound I-10 to northbound SR 143 (Ramp E-N) traffic movement to replace the existing 48th Street signalized intersection.

The Ramp E-N exit ramp (1 lane) would be developed as a mandatory exit from the outside local lane. East of Ramp E-N, the Broadway Road exit ramp (2 lanes) would be developed with a

mandatory exit from the outside lane, and the second lane designed as an optional lane with the through movement. Two local lanes would continue to the east through the system interchange.

The southbound SR 143 to eastbound I-10 (Ramp S-E) directional ramp (2 lanes) would bifurcate as a mandatory exit from the inside lanes, and then merge with the eastbound local lanes in the vicinity of Broadway Road. Ramp S-E would merge with the local lanes (2 lanes) to develop a four lane roadway between Broadway Road and US 60.

The Broadway Road TI west ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The Broadway Road entrance ramp would merge into the local lanes with a parallel entrance configuration. Broadway Road would be realigned in the vicinity of I-10. A new bridge would be constructed over I-10 to provide the spans needed to support the additional express and local lanes.

Access between University Drive and Broadway Road (along SR 143) would be provided with new one-way connector roads (2 lanes) between the 48th Street/Broadway Road intersection and the SR143/University Drive TI. The existing SR143 underpass would be removed from service.

A “local to express lanes” transfer ramp would be provided between the eastbound local lanes and the eastbound US 60 ramp (Ramp S-E) in the vicinity of Southern Avenue. The transfer ramp (2 lanes) would depart the local lanes with a mandatory “left-exit” configuration, and then merge with Ramp S-E (3 lanes) to develop five lanes that continue to the east on US 60. The existing Ramp S-E bridge over I-10 would be widened to provide the roadway width necessary to accept the additional lanes from the transfer ramp. New bridges would be provided for the eastbound local lanes and transfer ramp over Southern Avenue.

Two local lanes would continue to the south between US 60 and the I-10 entrance ramp. The local lanes (2 lanes) would merge with the eastbound express lanes (3 lanes) to develop five general-purpose lanes and one HOV lane that continue to the south.

Westbound Express Lanes

The I-10/SR202L (Santan) TI project recently widened the westbound I-10 roadway to four general-purpose lanes and one HOV lane approaching Ray Road from the south. An AASHTO lane-drop was provided to transition to the existing roadway width of three general-purpose lanes and one HOV lane north of Ray Road.

An additional westbound general-purpose lane would be provided on I-10 by removing the AASHTO lane drop and extending the fourth general-purpose lane to the north. The Ray Road entrance ramp would be realigned with a parallel entrance configuration and transition into an auxiliary lane that continues to the Warner Road exit ramp. Westbound I-10 would include four general-purpose lanes and one HOV lane between Ray and Elliot Roads.

The Warner Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Elliot Road exit ramp.

The Elliot Road exit ramp would be designed as a single-lane mandatory exit from the auxiliary lane. The northbound entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane to provide five general-purpose lanes and one HOV lane between Elliot Road and Baseline Road.

Five general-purpose lanes and one HOV lane would be provided on I-10 approaching the initial “express to local lanes” exit ramp to the westbound local lanes (and eastbound US 60) near Baseline Road. The Baseline Road exit ramp would be developed with a single-lane tapered exit configuration from the outside general-purpose lane. The initial “express to local lanes” exit ramp (2 lanes) would be developed with a mandatory exit from the outside freeway lane, and the second lane designed as an optional lane with the freeway through movement.

Four express lanes and one HOV lane would continue to the north approaching the I-10/US60 TI. A second “express to local lanes” transfer ramp (2 lanes) would be developed immediately south of US 60 to provide additional access to the local lanes. This ramp would be developed with a mandatory exit from the outside express lane, and the second lane designed as an optional lane with the freeway through movement. Three express lanes and one HOV lane would continue to the north through the I-10/US60 TI.

Five general-purpose lanes and one HOV lane would be provided on westbound US 60 west of Mill Avenue. The Mill Avenue entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Priest Drive exit ramp. The Priest Drive exit ramp (1 lane) would be designed as a mandatory exit from the auxiliary lane. The westbound US 60 to southbound I-10 directional ramp (Ramp W-S)(1 lane) would be developed near Priest Drive with a parallel “left-exit” configuration.

The westbound US 60 to westbound local lanes ramp (2 lanes) would be developed with a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the US 60 Ramp W-N through movement. Three lanes would continue to the west on Ram W-N to the I-10 express lanes.

Ramp W-N (3 lanes) would combine with the westbound I-10 express lanes (3 lanes) to develop six express lanes and two HOV lanes departing I-10/US60 TI. A new bridge would be constructed for Ramp W-N over the westbound local lanes.

The US 60 HOV lane would enter the westbound express lanes and combine with the I-10 HOV lane to provide two westbound HOV lanes between US 60 and I-17.

Six express lanes and two HOV lanes would be provided approaching the I-10/SR143 TI. An “express to local lanes” transfer ramp (2 lanes) would be developed near Broadway Road as a mandatory exit from the two outside express lanes. Four express lanes and two HOV lanes would continue to the west on I-10 to 32nd Street.

A “local to express lanes” transfer ramp (2 lanes) would be provided near 32nd Street. The transfer ramp would merge with the express lanes to develop six express lanes and two HOV lanes approaching the I-10/I-17 TI. The 24th Street exit would depart the express lanes with a

tapered exit configuration. The Salt River bridge would be widened to support the additional HOV and express lanes.

The express lanes would bifurcate at the I-10/I-17 TI to allow three lanes to continue to the west on I-17. Three express lanes and one HOV lane would also continue to the west on I-10.

The two I-10 local lanes near the I-10/I-17 TI would continue to the west and merge with the I-10 express lanes with a parallel entrance configuration. The outside lane would terminate prior to the Sky Harbor Boulevard entrance ramp to provide four general-purpose lanes and one HOV lane that continue to the north to the SR51/SR202L exit ramp.

The Buckeye Road exit ramp would be designed as a single-lane ramp with a tapered exit configuration. A new bridge would be provided for the westbound local lanes over Mohave Street.

The Sky Harbor Boulevard entrance ramp would be realigned with a parallel entrance configuration and transition into an auxiliary lane that continues to the Washington/Jefferson Street exit ramp. The SR51/SR202L exit ramp (2 lanes) would be developed with a mandatory exit from the outside general-purpose lane, and the second lane designed as an optional lane with the I-10 through movement. Three general-purpose lanes and one HOV lane would continue to the north on the I-10 mainline. The existing I-10 overpasses would be widened at Buckeye Road, Sky Harbor Circle North, and the UPRR.

A “local to express lanes” transfer ramp would provide access from the westbound local lanes to I-17 at the I-10/I-17 TI. The transfer ramp (2 lanes) would combine with westbound I-17 (3 lanes) to develop five general-purpose lanes. The outside lane on I-17 would terminate prior to the Ramp S-W gore to develop four general-purpose lanes and one HOV lane between the I-10/I-17 TI and 7th Street. Ramp S-W would be realigned and merge with westbound I-17 with a parallel entrance design. The existing I-17 bridge over I-10 would be widened to support the additional lanes entering I-17 at the transfer ramp.

The 16th Street entrance ramp (1 lane) would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the 7th Street exit ramp. The 7th Street exit ramp (2 lanes) would be developed as a mandatory exit from the auxiliary lane, and the second lane designed as an optional lane with the I-17 through movement. An AASHTO lane drop would occur to the west of the exit ramp to develop three general-purpose lanes and one HOV lane.

The 7th Street entrance ramp (1 lane) would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the 7th Avenue exit ramp. The 7th Avenue exit ramp (2 lanes) would be developed as a mandatory exit from the auxiliary lane.

The eastbound and westbound frontage roads would be realigned between 7th Avenue and 16th Street, and reduced from two lanes to one lane. The existing local access road south of I-17 and east of 16th Street would remain in service.

Westbound Local Lanes

Travelers destined for the westbound local lanes, or eastbound US 60 (via Ramp N-E), would depart I-10 just south of Baseline Road. The westbound “express to local lanes” exit ramp (2 lanes) would be developed with a mandatory exit from the outside express lane, and the second lane designed as an optional lane with the I-10 through movement. The existing westbound local lanes bridge would be widened to support the new ramp alignment.

The westbound local lanes (2 lanes) would continue to the north immediately east of the express lanes. The Baseline Road entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp N-E exit. Ramp N-E (1 lane) would be developed as a mandatory exit from the auxiliary lane. Two local lanes would continue to the north.

A second “express to local lanes” transfer ramp (2 lanes) would be provided just south of US 60. The transfer ramp would merge with the local lanes with a “lane-add” configuration. The outside local lane would terminate prior to the US 60 entrance ramp to develop three lanes approaching Southern Avenue.

The ramp from westbound US 60 to the local lanes (2 lanes) would be developed as a mandatory exit from the outside US 60 general-purpose lane, and the second lane designed as an optional lane with Ramp W-N. Three lanes would continue to the west on Ramp W-N to I-10.

The three local lanes from I-10 (from the south) would merge with the ramp from westbound US 60 (2 lanes) to develop five lanes immediately downstream of the I-10/US60 TI. The outside lane would terminate north of Southern Avenue to develop four local lanes approaching the I-10/SR 143 TI. A new bridge would be provided for the local lanes over Southern Avenue.

The Broadway Road TI east ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The Broadway Road exit ramp would be developed with a single-lane tapered exit configuration. The entrance ramp would be designed with a parallel entrance configuration that would merge into the local lanes prior to the Ramp S-W gore.

The westbound I-10 to northbound SR 143 (Ramp W-N) directional ramp (2 lanes) would be developed with a mandatory exit from the two outside local lanes, and two local lanes continuing to the west.

The “express to local lanes” transfer ramp near Broadway Road (2 lanes) would merge with the westbound local lanes (2 lanes) to develop a four lane roadway between SR 143 and the 40th Street exit ramp. The southbound SR 143 to westbound I-10 (Ramp S-W) directional ramp would enter the westbound local lanes with a parallel entrance configuration.

The 40th Street north ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections to the local lanes. The westbound exit ramp (2 lanes) would be developed with a mandatory exit from the outside lane, and the second lane designed as an

optional lane with the through movement. The 40th Street entrance ramp would be realigned with a parallel entrance configuration that transitions into an auxiliary lane that extends to the 32nd Street exit ramp.

The 32nd Street TI north ramps would be designed with a diamond interchange configuration with exit and entrance ramp connections with the local lanes. The exit ramp (1 lane) would be developed with a mandatory exit from the auxiliary lane. A westbound “local to express lanes” transfer ramp would be provided near 32nd Street. The transfer ramp (2 lanes) would be developed with a mandatory “left exit” from the inside lane, and the second lane designed as an optional lane with the through movement. Two local lanes would continue to the west. The 32nd Street entrance ramp would be realigned with a parallel entrance configuration that transitions into an additional lane to provide three local lanes approaching the I-10/I-17 TI. New bridges would be provided over the Salt River and 24th Street.

The two local lanes that continue to the west on I-10 would merge into the express lanes near Buckeye Road with a “lane-add” configuration. The outside lane would terminate in advance of the Sky Harbor Boulevard entrance ramp to provide four express lanes and one HOV lane that continue to the north to the SR51/SR202L exit ramp. The Buckeye Road exit ramp (1 lane) would be designed with a tapered exit configuration from the local lanes. A new bridge would be provided for the westbound local lanes over Mohave Street.

A “local to express lanes” transfer ramp (2 lanes) would provide a connection from the local lanes to westbound I-17. The transfer ramp would be developed as a mandatory exit from the inside lane, and the second lane designed as an optional lane with the through movement to I-10.

Advantages and Disadvantages:

The advantages of the Alternative 2 Express/Local Lanes concept are as follows:

- The I-10 express lanes would operate at LOS ‘D’ or better within the limits of the local lanes. Due to the lanes additional lanes provided on I-10 through the I-10/I-17 TI and the I-10/US60 TI, an additional 42,000 vpd (430,000 total) would be anticipated to travel through the Broadway Curve each day when compared with Alternative 1, and 108,000 vpd above the No-Build alternative.
- Three express lanes would be provided on I-10 at the I-10/I-17 TI and the I-10/US60 TI. By removing the “bottlenecks” proposed with Alternative 1, the capacity and level-of-service will improve on the segments of I-10 between SR 51 and I-17, and between US 60 and the Santan Freeway.
- This alternative would incorporate current ADOT design practice for 1.) lane balance for the development of additional lanes in advance of a system interchange, 2.) minimum number of lanes through a system interchange, 3.) method of terminating lanes departing a system interchange, and 4.) providing auxiliary lanes between service interchange entrance and exit ramps.
- At the north and south limits of the local lanes, the development of the entrance and exit transfer ramp connections with I-10, I-17 and US 60 would be modified to conform to current ADOT design practice for lane continuity and operational efficiency.

- Alternative 2 would provide two HOV lanes in each direction of travel on I-10 between I-17 and US 60, which would provide the capacity needed for the projected HOV demand.
- A potential future HOV directional ramp connection would be provided between I-10 (east of the I-10/I-17 TI) and I-17 (west of the I-10/I-17 TI) in accordance with the adopted HOV system plans.

The Disadvantages of the Alternative 2 Express/Local Lanes concept are as follows:

- Alternative 2 would require approximately 78 acres of new right-of-way acquisition that could impact 61 businesses and 261 residences at an estimated cost of \$262 million.
- Higher estimated construction cost (\$904 million).

3.4.5 Alternative 3 (Express/Local Lanes Concept)(With HOV Viaduct)

Alternative Overview:

The Alternative 3 concept plans are included in Appendix C. Alternative 3 was developed to elevate the four HOV lanes on viaduct bridge structure between I-17 and US 60 to attempt to reduce the right-of-way width that would be required for the I-10 improvements. All of the I-10, I-17, SR 143 and US 60 roadways, transfer ramps, and traffic interchanges would be similar to Alternative 2. The Alternative 3 traffic volume projections and level-of-service analysis results are also similar to Alternative 2.

The viaduct would be developed east of 24th Street and continue to approximately Fairmont Drive. The west end of the viaduct is located east of 24th Street to allow a sufficient distance to transition the four HOV lanes into the median of the express lanes prior to the I-10/I-17 TI. One HOV lane would continue to the north on I-10, with the second HOV lane continuing to the west to I-17. Terminating the viaduct east of 24th Street would also be necessary to avoid impacting the south runway approach and departure surfaces at Phoenix Sky Harbor International Airport.

The viaduct would transition back to the express lane near Fairmont Drive, which would allow one HOV lane to continue to the south on I-10, and the second HOV lane to use the existing HOV directional ramp to access US 60. The viaduct would be elevated above I-10 approximately 25' between each arterial street, 50' at each arterial street crossing, and approximately 75' at the I-10/SR143 TI.

The viaduct would likely be supported with 12' diameter columns that would be placed within the median of the express lanes. The columns would be spaced approximately 120' apart for the full length of the viaduct.

The viaduct would reduce the width of the right-of-way acquisition area by approximately 23' on each side of I-10 when compared with Alternative 2. However, the right-of-way acquisition area would be greater than Alternative 2 near 24th Street and Fairmont Drive due to the roadway geometry required to develop the HOV viaduct ramp gore areas.

The initial construction cost estimate for the viaduct is approximately \$170 million. By comparison, the Alternative 3 right-of-way acquisition cost estimate is approximately \$32 million less than

Alternative 2. Therefore, the cost of the viaduct would significantly exceed the anticipated savings in right-of-way acquisition costs.

Advantages and Disadvantages:

The advantages of the Alternative 3 Express/Local Lanes concept are as follows:

- Similar to Alternative 2
- Would reduce the estimated right-of-way acquisition to approximately 70 acres, which could potentially impact 63 businesses and 261 residences with an estimated cost of \$230 million.

The Disadvantages of the Alternative 3 Express/Local Lanes concept are as follows:

- Highest estimated construction cost (\$1.22 billion).
- The elevated viaduct bridge would be very difficult to construct and maintain the existing travel lanes open to traffic.
- The viaduct would likely need to be constructed for the total length of the bridge with a single construction project. The construction of the total length of the bridge would not be possible with current funding limitations.
- Elevating the HOV lanes would introduce accessibility concerns for emergency service vehicles should an incident occur on the viaduct.
- The viaduct would impose a significant visual impact on the adjacent communities.

3.4.6 Alternative 4 (Express/Local Lanes Concept)

Alternative Overview:

Alternative 4 would modify the Alternative 2 configuration by removing one lane in each direction of travel from the local lanes, and shifting these lanes to the express lanes. This alternative was developed to evaluate how the I-10 express and local lanes would operate with this configuration when compared to Alternative 2. The roadway concept plans, Year 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are included in Appendix C.

At the north and south limits of the local lanes, the development of the entrance and exit ramp connections with I-10, I-17, SR 143 and US 60 were modified to conform to ADOT design practice for lane continuity and operational efficiency similar to Alternative 2.

I-10 would include three to seven express lanes in each direction of travel between Buckeye and Baseline Roads. The local lanes would vary from two to three lanes in each direction of travel and would provide access to SR 143 and the local street system. Two lane transfer ramps would provide connections between the express and local lanes and vice versa. Auxiliary lanes would generally be provided between service interchange entrance and exit ramps.

The I-10/SR 143 TI would be reconstructed to provide a fully directional freeway-to-freeway system interchange with ramp connections with SR 143 and local lanes.

Six express lanes would be developed on westbound I-10 approaching the I-10/I-17 TI that would allow three lanes each to continue to I-10 and I-17. Three lanes would be provided on the eastbound I-10 express lanes through the I-10/I-17 TI.

Six express lanes would be developed on eastbound I-10 approaching the I-10/US60 TI. Three lanes would continue to the south on I-10, with three lanes exiting to eastbound US 60. Three express lanes would be provided on westbound I-10 through the I-10/US60 TI.

A potential future HOV directional ramp connection would be provided between I-10 (east of the I-10/I-17 TI) and I-17 (west of the I-10/I-17 TI). One HOV lane would be retained on I-10 in each direction of travel between SR 51 and I-17. Two HOV lanes would be provided in each direction of travel on I-10 between I-17 and US 60, and one HOV lane would be retained in each direction of travel between US 60 and the Santan Freeway.

Advantages and Disadvantages:

The advantages of the Alternative 4 Express/Local Lanes concept are as follows:

- One additional express lane would be provided at selected locations within the corridor when compared with Alternative 2.
- The I-10 express lanes would operate at LOS 'D' or better within the limits of the local lanes. Due to the lanes additional lanes provided on I-10 through the I-10/I-17 TI and the I-10/US60 TI, an additional 42,000 vpd (430,000 total) would be anticipated to travel through the Broadway Curve each day when compared with Alternative 1, and 108,000 vpd above the No-Build alternative.
- Three express lanes would be provided on I-10 at the I-10/I-17 TI and the I-10/US60 TI. By removing the "bottlenecks" proposed with Alternative 1, the capacity and level-of-service will improve on the segments of I-10 between SR 51 and I-17, and between US 60 and the Santan Freeway.
- This alternative would incorporate current ADOT design practice for 1.) lane balance for the development of additional lanes in advance of a system interchange, 2.) minimum number of lanes through a system interchange, 3.) method of terminating lanes departing a system interchange, and 4.) providing auxiliary lanes between service interchange entrance and exit ramps.
- At the north and south limits of the local lanes, the development of the entrance and exit transfer ramp connections with I-10, I-17 and US 60 would be modified to conform to current ADOT design practice for lane continuity and operational efficiency.
- Alternative 4 would provide two HOV lanes in each direction of travel on I-10 between I-17 and US 60, which would provide the capacity needed for the projected HOV demand.
- A potential future HOV directional ramp connection would be provided between I-10 (east of the I-10/I-17 TI) and I-17 (west of the I-10/I-17 TI) in accordance with the adopted HOV system plans.

The Disadvantages of the Alternative 4 Express/Local Lanes concept is as follows:

- Approximately 1,500 vph would be redistributed from the local lanes to the express lanes when compared with Alternative 2.

- When compared with Alternative 2, Alternative 4 would provide one less local lane in each direction of travel throughout the corridor. This situation would likely induce additional congestion on the local lanes during the peak travel periods.
- Alternative 4 would require approximately 82 acres of new right-of-way acquisition that could impact 64 businesses and 261 residences at an estimated cost of \$261 million.
- Higher estimated construction cost (\$908 million).

3.4.7 Alternative 5 (Widen I-10 Concept)

Alternative Overview:

An alternative was also developed to evaluate the possibility of adding capacity to I-10 by conventionally widening the I-10 mainline between Buckeye Road and Baseline Road. The Year 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are shown in Appendix C.

Northbound I-10 and westbound US 60 would approach the I-10/US60 TI with four general-purpose lanes and one HOV lane in each direction of travel. Similarly, southbound (eastbound) I-17 and eastbound (southbound) I-10 would approach the I-10/I-17 TI with four general-purpose lanes and an HOV lane in each direction of travel. Eight general-purpose lanes and two HOV lanes would be provided in each direction of travel on I-10 between the I-10/I-17 TI and the I-10/US60 TI.

The results of the level-of service analysis indicate Alternative 5 would provide LOS 'E' or 'F' operating conditions on westbound I-10 between Broadway Road and the Santan Freeway in the A.M. peak period. LOS 'E' or 'F' operating conditions would also be provided on eastbound I-10 between US 60 and Buckeye Road in the P.M. peak period.

While Alternative 5 would carry higher volumes of traffic than the "No-Build" alternative, this alternative would result in similar traffic congestion and vehicle queue lengths as the "No-Build" alternative since the existing weaving conditions would remain at the Broadway Curve.

3.5 LOCAL ACCESS OPTIONS

3.5.1 Introduction

In addition to the freeway widening alternatives, numerous options were developed to restore the existing access to the local arterial street system in conjunction with the Express/Local lanes alternatives.

The interchange modification options were developed in order to retain the existing lane configurations for the crossroads and ramp terminals, optimize the geometric design elements of the ramp and intersection roadways, minimize environmental impacts, maintain the improvements within the existing right-of-way, minimize construction costs, and minimize impacts to local traffic during construction.

3.5.2 West Entrance to Phoenix Sky Harbor International Airport

3.5.2.1 Background

The Phoenix Aviation Department Director submitted a letter to ADOT in August 2005 that included a list of concerns regarding the interface of the I-10 widening alternatives with the west entrance to Phoenix Sky Harbor International Airport (PSHIA). A few of the concerns included the following:

- Access should be retained between Interstate 17 (I-17) and the west airport entrance;
- The airport access locations should accommodate traffic growth forecasts;
- Consider and accommodate airport security infrastructure and operations;
- Provide easy and intuitive access with direct access points and appropriate signing, both for the east and west airport entrances;
- Reduce non-airport cut-through traffic;
- Minimize encroachments into the airport that could impact the operations of the runways.

The ADOT project team has been meeting regularly with representatives of Phoenix Aviation Department which has resulted in the development of the following options for the west entrance to PSHIA.

3.5.2.2 Option 1: I-10 Widening Alternative 2

The Alternative 2 Express/Local Lanes configuration is based on the concept that was developed in 1988 with the *I-10 Corridor Refinement Study*. The 1988 concept was updated to provide additional capacity for projected design year 2030 traffic volumes, provide additional HOV lane capacity and system improvements for the planned Bus Rapid Transit (BRT) and Express Bus system identified in the RTP, and to conform to current roadway design criteria and practice. The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are included in Appendix C.

The I-10 Widening Alternative 2 also includes provisions to construct an HOV directional ramp connection between I-10 (east of the I-10/I-17 TI) and I-17 as shown in green the roadway concept drawings.

The 24th Street TI would be retained with ramp connections to the I-10 express lanes (to/from the east). The westbound local lanes would pass over 24th Street, and then bifurcate to provide ramp connections to westbound I-17 and the westbound (northbound) I-10 express lanes. Traffic on the local lanes that is destined for PSHIA and the Rental Car Center would exit the local lanes at the Buckeye Road exit ramp.

The existing directional ramp connection between eastbound I-17 and the westbound (northbound) I-10 express lanes (Ramp E-N) would remain in the current configuration to retain this freeway-to-freeway traffic movement. The Buckeye Road exit ramp would be disconnected from the I-10 express lanes, thereby removing the connection between the eastbound I-17 mainline and PSHIA. Travelers on eastbound I-17 that are destined for PSHIA would be required

to exit from I-17 at 16th Street, travel north on 16th Street to Buckeye Road, and then continue to the east on Buckeye Road.

The eastbound local lanes would be initiated with a two lane exit departing the I-10 express lanes in the vicinity of Buckeye Road. Access to the I-10 express lanes from Buckeye Road would be eliminated by realigning the Buckeye Road entrance ramp to connect to the eastbound local lanes, thereby eliminating the connection between Buckeye Road and westbound I-17. Traffic originating at PSHIA that is destined to westbound I-17 would continue to the west on Buckeye Road to 16th Street, travel south on 16th Street to I-17, and then enter the westbound I-17 entrance ramp.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The I-10 and I-17 freeway-to-freeway movements would remain on directional ramp connections at the I-10/I-17 TI.
- Would retain the existing directional ramps between Sky Harbor Boulevard and I-10 (to/from the north).
- Access to I-10 (to/from the east) would be retained with ramp connections between Buckeye Road and the eastbound and westbound local lanes.
- Would not require additional right-of-way acquisition from the Rental Car Center.
- Would not impact the SROG sanitary sewer line located along the Rental Car Center property line.

The disadvantages of this option would include the following:

- Eliminates the existing freeway access between I-17 and PSHIA.
- The westbound local lanes would be located toward the south runway in the vicinity of 24th Street.

3.5.2.3 Option 2: Fully Directional TI at Sky Harbor Boulevard

This option was developed to retain the existing I-10 access into PSHIA with directional ramp connections with Sky Harbor Boulevard. This alternative would restore the existing access between I-17 and PSHIA. The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are included in Appendix D.

The 24th Street TI would be retained with ramp connections to the I-10 express lanes (to/from the east). The westbound local lanes would pass over 24th Street, and then bifurcate to provide ramp connections to westbound I-17 and the westbound (northbound) I-10 express lanes. The westbound local lanes would be reconfigured to merge with the westbound I-10 express lanes in the vicinity of Mohave Drive. A separate exit would be developed to provide a ramp connection between the westbound local lanes and Sky Harbor Boulevard. The existing Buckeye Road TI would be eliminated with this option.

The existing freeway-to-freeway ramp between eastbound I-17 and the westbound (northbound) I-10 express lanes (Ramp E-N) would be realigned to pass beneath the westbound local lanes,

over Mohave Street, and then merge with to the I-10 express lanes near Buckeye Road. Traffic that is destined for PSHIA would depart Ramp E-N at the Sky Harbor Boulevard exit ramp.

A short weaving segment would be introduced on Ramp E-N between approximately Mohave Street and the Sky Harbor Boulevard directional ramp exit. The weaving distance provided would not achieve the minimum criteria required between successive entrance and exit ramps. However, travelers on the westbound local lanes that are destined for PSHIA would be anticipated to exit the local lanes and remain in the outside lane to access the airport.

The eastbound local lanes would be developed with a two lane exit departing the I-10 express lanes in the vicinity of Buckeye Road. A new directional ramp would be elevated over the I-10 express lanes and Buckeye Road to provide a connection between westbound Sky Harbor Boulevard and the eastbound local lanes. The existing north ramps to and from Sky Harbor Boulevard would remain connected to the I-10 express lanes. The directional ramp would merge into the eastbound local lanes with a "lane-add" configuration that would transition into an auxiliary lane that would continue to the south.

An exit ramp would be developed from the eastbound local lanes to restore the connection between PSHIA and westbound I-17. This ramp would merge into Ramp S-W with a "lane-add" design that continues to the west, resulting in an additional freeway lane departing the I-10/I-17 TI. Due to the additional lane, the project limits would be extended on I-17 from 7th Street to 7th Avenue.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The I-10 and I-17 freeway-to-freeway movements would remain on directional ramp connections at the I-10/I-17 TI.
- Would retain the existing directional ramps between Sky Harbor Boulevard and I-10 (to/from the north).
- Access to I-10 (to and from the east) would be retained with ramp connections between Sky Harbor Boulevard and the eastbound and westbound local lanes.
- Restores full freeway access between I-17 and PSHIA.

The disadvantages of this option would include the following:

- This alternative would eliminate the existing ramps at Buckeye Road, thereby eliminating direct freeway access for the commercial development west of I-10 and north of I-17.
- A short weaving segment would be introduced on Ramp E-N between approximately Mohave Street and the Sky Harbor Boulevard directional ramp.
- A short weaving segment would be introduced on the eastbound local lanes between the Sky Harbor Boulevard entrance ramp and the westbound I-17 exit ramp.
- One additional freeway lane would be required along westbound I-17 departing the system interchange, extending the project limits to the west from 7th Street to 7th Avenue.
- This option would retain two entry roads into the airport (Sky Harbor Boulevard and Buckeye Road), which could impact the location and operation of a future security plaza within PSHIA.

- The new directional ramps could encourage higher travel speeds for traffic entering the airport, which could impose safety concerns at a future security plaza during high alert periods.
- The new Sky Harbor Boulevard exit ramp (from the westbound local lanes) would be located in a similar location in relation to the south runway as the Option 1 westbound local lanes alignment.
- The new ramp connection from the eastbound local lanes to westbound I-17 would require additional right-of-way from the Rental Car Center property.
- The new ramp connection from the eastbound local lanes to westbound I-17 would conflict with the recently relocated SROG sanitary sewer line.

3.5.2.4 Option 3: Single-Point Urban Interchange at Buckeye Road

This alternative was developed to provide full access into the airport from I-10 with a single-point urban interchange (SPUI) at Buckeye Road. This alternative would restore the existing connections between I-17 and the PSHIA (at Buckeye Road). The existing directional ramp connections to I-10 (to/from the north) would be eliminated to consolidate the existing roadways into a single point of access into the airport. The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are provided in Appendix D.

The 24th Street TI would be retained with ramp connections to the I-10 mainline (to/from the east). The westbound local lanes would pass over 24th Street, and then bifurcate to provide ramp connections to westbound I-17 and the westbound (northbound) I-10 express lanes. The westbound local lanes would be reconfigured to merge with the westbound I-10 express lanes in the vicinity of Mohave Drive. A separate exit would be developed to provide a ramp connection between the westbound local lanes and Buckeye Road.

The existing freeway-to-freeway ramp between eastbound I-17 and the westbound (northbound) I-10 express lanes (Ramp E-N) would be realigned to pass beneath the westbound local lanes, over Mohave Street, and then merge with the I-10 express lanes near Buckeye Road. Traffic that is destined for PSHIA would depart Ramp E-N at the Buckeye Road exit ramp. The design of the roadway segment on Ramp E-N would be modified from Option 2 to incorporate a concrete median barrier that would be placed between Ramp E-N and the Buckeye Road exit ramp (from the westbound local lanes). This configuration would eliminate the weaving movement described in Option 2. The median barrier would extend to the north to the Buckeye Road exit ramp gore (from Ramp E-N). The Buckeye Road exit ramp (from Ramp E-N) would be designed as a two lane ramp that would provide one exit ramp lane from Ramp E-N, and one exit ramp lane from the westbound local lanes.

The eastbound local lanes would be developed with a two lane exit departing the I-10 express lanes in the vicinity of Buckeye Road. The Buckeye Road entrance ramp would connect to the local lanes with a parallel entrance configuration. A new southbound connector ramp would be provided between Buckeye Road and westbound I-17 that would be constructed immediately west of and adjacent to the eastbound local lanes. This roadway configuration would eliminate the weaving section on the eastbound local lanes that was depicted on Option 2. The Buckeye Road entrance ramp (to westbound I-17) would merge into Ramp S-W with a "lane-add" design that

continues to the west, resulting in an additional freeway lane departing the I-10/I-17 TI. Due to the additional lane, the project limits would be extended on I-17 from 7th Street to 7th Avenue.

A SPUI would be provided at Buckeye Road that would provide access to I-10 and I-17 in all directions of travel. In order to provide the operational efficiency needed at the interchange, the City may consider grade-separating the intersection of 24th Street and Buckeye Road. A grade separated intersection would increase the operational efficiency of the SPUI by eliminating the closely spaced traffic signals.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The I-10 and I-17 freeway-to-freeway movements would remain on directional ramp connections at the I-10/I-17 TI.
- Access to I-10 (to/from the east) would be retained with ramp connections between Buckeye Road and the eastbound and westbound local lanes.
- This option would provide direct freeway access (in all directions of travel) for the commercial development located west of I-10 and north of I-17.
- Would restore full access between I-17 and PSHIA with ramp connections to Buckeye Road.
- This option would eliminate the weaving area on Ramp E-N associated with Option 2.
- This option would eliminate the weaving area on the eastbound local lanes associated with Option 2.
- The SPUI interchange option would consolidate all traffic movements at one point of access into PSHIA (at Buckeye Road), which could better support a future security plaza.
- The SPUI option may discourage airport cut-through traffic on Sky Harbor Boulevard.
- The proposed alignment of the southbound connector ramp (from Buckeye Road to westbound I-17) would avoid additional right-of-way acquisition from the Rental Car Center.
- The proposed alignment of the southbound connector ramp (from Buckeye Road to westbound I-17) would avoid the recently relocated SROG sanitary sewer line.

The disadvantages of this option would include the following:

- Would eliminate the existing directional ramp connections between Sky Harbor Boulevard and I-10 (to/from the north).
- The SPUI interchange configuration may not provide sufficient capacity for the anticipated growth in traffic caused by adjacent commercial development, planned airport development, and anticipated growth in airline passengers.
- One additional freeway lane would be required along westbound I-17 departing the system interchange, extending the project limits to the west from 7th Street to 7th Avenue.
- The new Buckeye Road exit ramp (from the westbound local lanes) would be located in a similar location in relation to the south runway as the Option 1 westbound local lanes alignment.

3.5.2.5 Option 4: Directional Ramps With Sky Harbor Boulevard, Half Interchange at Buckeye Road

This option was developed to incorporate desirable elements of Options 2 and 3 by retaining the existing directional ramp connections to Sky Harbor Boulevard (to/from the north), and providing a half-diamond interchange at Buckeye Road (ramps to/from the south). The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are provided in Appendix D.

The 24th Street TI would be retained with ramp connections to the I-10 express lanes (to/from the east). The westbound local lanes would pass over 24th Street, and then bifurcate to provide ramp connections to westbound I-17 and the westbound (northbound) I-10 express lanes. The westbound local lanes would be reconfigured to merge with the westbound I-10 express lanes in the vicinity of Mohave Drive. A separate exit would be developed to provide a ramp connection between the westbound local lanes and Buckeye Road.

The existing freeway-to-freeway ramp between eastbound I-17 and the westbound (northbound) I-10 express lanes (Ramp E-N) would be realigned to pass beneath the westbound local lanes, over Mohave Street, and then merge with the I-10 express lanes near Buckeye Road. Traffic that is destined for PSHIA would depart Ramp E-N at the Buckeye Road exit ramp with a configuration similar to Option 3.

The eastbound local lanes would be developed with a two-lane exit departing the I-10 express lanes in the vicinity of Buckeye Road. The Buckeye Road entrance ramp would connect to the local lanes with a parallel entrance configuration. A new southbound connector ramp would be provided between Buckeye Road and westbound I-17 that would be constructed immediately west of and adjacent to the eastbound local lanes, similar to Option 3. This new ramp would merge into Ramp S-W with a "lane-add" design that continues to the west, resulting in an additional freeway lane departing the I-10/I-17 TI. Due to the additional lane, the project limits would be extended on I-17 from 7th Street to 7th Avenue.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The I-10 and I-17 freeway-to-freeway movements would remain on directional ramp connections at the I-10/I-17 TI.
- Would retain the existing directional ramps between Sky Harbor Boulevard and I-10 (to/from the north).
- Access to I-10 (to the east) would be retained with ramp connections between Buckeye Road and the eastbound and westbound local lanes.
- Restores full freeway access between I-17 and PSHIA.
- This option would eliminate the weaving area on Ramp E-N similar to Option 3.
- Would eliminate the weaving area on the eastbound local lanes similar to Option 3.
- The proposed alignment of the southbound connector ramp (from Buckeye Road to westbound I-17) would avoid additional right-of-way acquisition from the Rental Car Center.

- The proposed alignment of the southbound connector ramp (from Buckeye Road to westbound I-17) would avoid the recently relocated SROG sanitary sewer line.

The disadvantages of this option would include the following:

- One additional freeway lane would be required along westbound I-17 departing the system interchange, extending the project limits to the west from 7th Street to 7th Avenue.
- This option would retain two entry roads into the airport (Sky Harbor Boulevard and Buckeye Road), which could impact the location and operation of a future security plaza within PSHIA.
- The new Buckeye Road exit ramp (from the westbound local lanes) would be located in a similar location in relation to the south runway as the Option 1 westbound local lanes alignment.

3.5.2.6 Option 5: Fully Directional TI at Sky Harbor Boulevard, East Ramps at 16th Street TI

This alternative was developed to evaluate the possibility of providing access between I-10 (to/from the east) and the 16th Street TI. The roadway concept plan is included in Appendix D.

Providing access to 16th Street would introduce significant impacts to the existing commercial development south of I-17 and I-10, the Rental Car Center, and the SROG sanitary sewer line.

At a meeting held with representatives of ADOT, FHWA, Phoenix Aviation Department and Phoenix Street Transportation Department on November 15, 2005, all parties agreed this alternative would induce significant impacts and therefore was eliminated from further consideration. This confirmed an earlier decision resulting from a meeting held on October 4, 2002 with representatives of ADOT, Phoenix Aviation Department, Phoenix Street Transportation Department, and Phoenix Water Service Department regarding the alignment of the relocated SROG sanitary sewer line along the Rental Car Center property.

3.5.3 24th Street Traffic Interchange

3.5.3.1 Option 1: Half Diamond TI with the Express Lanes

This option would retain the existing half-diamond interchange configuration with ramp connections to the eastbound and westbound express lanes (to/from the east). The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are provided in Appendix D.

Advantages and Disadvantages:

The advantages of this option would include the following:

- Travelers on the westbound I-10 express lanes would have opportunities to access PSHIA and the Rental Car Center from either the express lanes (at 24th Street) or the westbound local lanes (at Buckeye Road).
- The 24th Street westbound exit ramp connection to the I-10 express lanes would provide a second opportunity for travelers to access PSHIA and the Rental Car Center if they should miss the westbound local lanes exit near Broadway Road.

- This option would support all of the West Airport Access options included in Section I.

The disadvantages of this option would include the following:

- The ramp connections to and from the I-10 express lanes could reduce the level-of-service of the express lanes approaching and departing the I-10/I-17 TI, since the 24th Street ramps would connect to the I-10 express lanes near the system interchange.
- The 24th Street exit ramp alignment associated with this option would require the westbound local lanes to be constructed further toward the south runway.

3.5.3.2 Option 2: Half Diamond TI with the Local Lanes

This option would retain the existing half-diamond interchange configuration with ramp connections to the eastbound and westbound local lanes (to/from the east). The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are provided in Appendix D.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The 24th ramp connections to the local lanes would improve the operational characteristics of the I-10 express lanes approaching and departing the I-10/I-17 TI.
- Providing the 24th Street exit ramp connection to the westbound local lanes would allow that roadway to be shifted toward the express lanes and further away from the south runway.
- This option would support all of the West Airport Entrance options included in Section I.

The disadvantages of this option would include the following:

- All traffic destined for 24th Street or Buckeye Road (west PSHIA entrance or Rental Car Center) would be required to exit the westbound I-10 express lanes near Broadway Road and use the westbound local lanes to access these interchanges.

3.5.3.3 Option 3: Full Diamond TI with the Local Lanes

This option would reconfigure the 24th Street TI into a full diamond interchange configuration by providing ramp connections to the eastbound and westbound local lanes in all directions of travel. The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are included in Appendix D.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The 24th ramp connections to the local lanes would improve the operational characteristics of the I-10 express lanes approaching and departing the I-10/I-17 TI.
- Providing the 24th Street exit ramp connection to the westbound local lanes would allow that roadway to be shifted toward the express lanes and further away from the south runway.
- New access would be provided to I-10 (to/from the west) for the commercial development located south of I-10.

The disadvantages of this option would include the following:

- All traffic destined for 24th Street or Buckeye Road (west PSHIA entrance or Rental Car Center) would be required to exit the westbound express lanes near Broadway Road and use the local lanes to access these interchanges.
- This option would not support the West Airport Access Options 2, 3 or 4 that are described in Section I. Direct freeway access between I-17 and PSHIA would not be feasible with this option.

3.5.4 I-10/SR43 Traffic Interchange

3.5.4.1 Background

ADOT and outside agency representatives were concerned about the possibility of eliminating the existing access between I-10 and University Drive (on SR 143), and between eastbound I-10 and southbound 48th Street, that would result from the Alternative 2 I-10 Widening Concept.

As a result of these comments, the Project Team developed additional alternatives at the SR 143 interchange that would restore the south ramp connections at the University Drive TI, and the ramp connection between I-10 and 48th Street to the south.

3.5.4.2 Option 1: I-10 Widening Alternative 2 (1988 Configuration)

The existing I-10/SR143 TI would be reconstructed to provide a three level system interchange with directional ramps for the freeway-to-freeway traffic movements. The roadway concept plans, 2030 traffic volume projections, lane diagrams, and level-of-service analysis results are provided in Appendix D.

The SR 143 mainline would terminate north of I-10 and would no longer provide direct access to 48th Street. The SR 143 southbound mainline would bifurcate into the directional ramps that would connect to the eastbound and westbound local lanes.

Access to SR 143 from 48th Street would be provided with separate northbound and southbound connector roads that extend from Broadway Road to University Drive. The south ramps of the University Drive TI would be disconnected from SR 143, and realigned to connect to the 48th Street Connector Roads.

The University Drive TI ramp intersections would be reconfigured into a modified single-point urban interchange (SPUI) configuration that would allow the 48th Street Connector Road traffic to pass through the ramp intersections to access SR 143. For example, southbound traffic destined to 48th Street (or Broadway Road) would exit the SR143 at the University Drive TI exit ramp, pass through the ramp intersection, and continue to the south on the southbound 48th Street Connector Road to Broadway Road.

The southbound SR 143 to the westbound local lanes (Ramp S-W) and westbound local lanes to northbound SR 143 ramps (Ramp W-N) would remain at similar elevations as the existing ramps. The southbound SR 143 to eastbound local lanes ramp (Ramp S-E) would be designed at the

second level (approximately 25' above I-10), and the eastbound local lanes to northbound SR 143 ramp (Ramp E-N) would be designed at the third level (approximately 50' above I-10). The northbound 48th Street Connector Road would be designed at the third level, while the southbound 48th Street Connector Road would be placed at the second level.

Similar to existing conditions, freeway access would not be provided for the northbound 48th Street to westbound I-10 traffic movement. Travelers destined for westbound I-10 from 48th Street would be required to use the 40th Street TI.

A full diamond TI would be provided at Broadway Road with ramp connections to the eastbound and westbound local lanes. The existing ramp connection from eastbound I-10 to 48th Street/Broadway Road would be removed and replaced with a new ramp from the eastbound local lanes to Broadway Road. Travelers on the eastbound local lanes that are destined to southbound 48th Street would be required to exit the eastbound local lanes at the 40th Street TI, travel southbound on 40th Street to Broadway Road, and then continue to the east on Broadway Road to 48th Street. Travelers could also access 48th Street by exiting the eastbound local lanes at Broadway Road, and then traveling westbound on Broadway Road to 48th Street.

The University Drive TI (SPUI configuration) currently provides full freeway access with SR143. Traffic can then access I-10 from SR 143 via the existing I-10/SR143 TI ramps. However, the limited distance between the University Drive TI south ramps and I-10/SR143 TI directional ramps is causing significant traffic congestion on southbound SR 143 due to current vehicle weaving during the peak travel periods. The SR 143 TI Ramp S-E (loop ramp) also contributes to congestion on the southbound roadway.

The roadway geometry required for the new I-10/SR143 TI directional ramps would further reduce the weaving length provided on SR 143. Due to this concern University Drive TI south ramps would be disconnected from SR 143.

Traffic generated from the commercial and industrial development within the vicinity of University Drive and 48th Street would not be able to access the freeway system to the south of University Drive. These travelers would be required to access I-10 at 32nd Street, 40th Street, or Broadway Road.

Existing frontage roads are currently located immediately east and west of SR 143. The frontage roads would be relocated to the outside of the proposed freeway improvements to retain the existing access between University Drive and Elwood Street within the City of Phoenix, and between University Drive and 14th Street within the City of Tempe.

Advantages and Disadvantages:

The advantages of this option would include the following:

- Would provide directional ramp connections between SR 143 and the local lanes.
- Would restore the existing access between 48th Street and SR 143 with the connector roads.
- This option would eliminate the weaving areas on the northbound and southbound SR 143 mainline between the I-10/SR143 TI and University Drive.

- This option would retain direct freeway access at Broadway Road with ramp connections to the local lanes.

The disadvantages of this option would include the following:

- This option would not provide access between the eastbound local lanes and 48th Street (to the south). Access is currently provided from eastbound I-10 to 48th Street.
- This option would not provide direct freeway access between the University Drive south ramps and the I-10 corridor.
- The proposed reconfiguration of the I-10/SR143 TI would require the relocation of the existing frontage roads located east and west of the existing SR 143 right-of-way. New right-of-way acquisition would be necessary to support the proposed freeway improvements and realigned frontage roads.
- The modified SPUI configuration at the University Drive TI would result in LOS 'F' operational characteristics due to the additional demand from the 48th Street Connector Roads.

3.5.4.3 Option 2: Restore University Drive TI South Ramps Concept 1

A revised concept for the SR 143 and University Drive interchanges was developed to restore the access between University Drive and I-10. The total distance available between University Drive and I-10 is approximately 3,000 feet. The roadway concept plan, 2030 traffic volume projections, lane diagram, and level-of-service analysis results are included in Appendix D.

In the westbound direction of travel, the westbound ramp from the local lanes to northbound SR 143 (Ramp W-N) would be braided under Ramp E-N, which would allow Ramp W-N to transition into the inside general-purpose lanes for northbound SR 143. A separate exit would be developed for University Drive that would depart Ramp W-N east of SR 143 and continue to the north to University Drive.

Ramp E-N would pass over the Southbound 48 Street Connector Road, I-10 express and local lanes, and Ramp W-N to continue to the north to develop the outside general-purpose lane for the northbound SR 143 mainline. The northbound 48th Street entrance ramp would merge into Ramp E-N with a "lane-add" configuration. A two lane mandatory exit would depart Ramp E-N to provide access to University Drive.

Travelers on Ramp E-N that are destined to northbound SR 143 would remain in the left lane and continue to the north on SR 143. Travelers on Ramp E-N that are destined to University Drive would be required to make one lane change to the right to access the University Drive exit ramp. Travelers on the 48th Street entrance ramp that are destined for University Drive would remain in the right lanes to access the University Drive exit, while traffic destined for northbound SR 143 would be required to make one lane change to the left. The University Drive TI east ramp intersection would be retained in its current configuration.

Just south of University Drive, Ramp W-N and Ramp E-N would merge to develop three general-purpose lanes for the northbound SR 143 mainline, and then transition into two general-purpose lanes prior to the University Drive overpass.

In the opposite direction of travel, Ramp S-E would be retained as a two lane ramp to provide a connection between the southbound SR 143 mainline and the eastbound local lanes. The existing southbound University Drive entrance ramp connection to the SR 143 mainline would be restored with a "lane-add" configuration that would transition into an auxiliary lane and continue to the Ramp S-W exit. Ramp S-W would be developed as a mandatory exit from the auxiliary lane.

Three southbound lanes would be provided on the SR 143 mainline approaching the system interchange, with the left two lanes continuing onto Ramp S-E and one lane continuing to Ramp S-W.

The southbound 48th Street Connector Road would continue to the south from the University Drive entrance ramp with a frontage road configuration. The University Drive TI west ramp intersection would be reconfigured to a "modified SPUI" design to allow traffic destined to 48th Street from southbound SR 143 to exit the freeway system at the University Drive exit ramp, pass through the ramp intersection, and then continue to the south on the southbound connector road.

Should future operational analysis determine three northbound and southbound lanes on SR 143 would be warranted, it may be desirable to modify the University Drive TI from a SPUI to a tight diamond interchange due to the impacts the mainline widening would have on the SPUI geometry.

Existing frontage roads are currently located immediately east and west of SR 143. The frontage roads would be relocated to the outside of the proposed freeway improvements to retain the existing access between University Drive and Elwood Street within the City of Phoenix, and between University Drive and 14th Street within the City of Tempe.

Advantages and Disadvantages:

The advantages of this option would include the following:

- Would provide directional ramp connections between SR 143 and the I-10 local lanes.
- Would restore the existing access between 48th Street and SR 143.
- Would provide direct freeway access between University Drive and I-10 by restoring the south ramps at the University Drive TI.
- Would retain direct freeway access at Broadway Road with ramp connections to the I-10 local lanes.

The disadvantages of this option would include the following:

- This option would introduce a short weaving area on the segment of the southbound SR 143 mainline between the University Drive entrance ramp and Ramp S-W.
- The proposed reconfiguration of the I-10/SR143 TI would require the relocation of the existing frontage roads located east and west of the existing SR143 right-of-way. New right-of-way acquisition would be necessary to support the freeway improvements and realigned frontage roads.
- The modified SPUI configuration at the University Drive TI would result in LOS 'F' operating characteristics due to the additional traffic demand for the southbound 48th Street Connector Road.

3.5.4.4 Option 3: Restore University Drive TI South Ramps Concept 2

This alternative is similar to Option 2 in the westbound to northbound direction of travel. In the southbound to eastbound direction of travel, all proposed improvements would be similar to Option 2, except for traffic destined to 48th Street from southbound SR 143. Option 3 would provide a separate exit from the southbound SR 143 mainline to the southbound connector road, which would eliminate the need for this traffic to pass through the University Drive TI west ramp intersection. The roadway concept plan, 2030 traffic volume projections, lane diagram, and level-of-service analysis results are included in Appendix D.

A new bridge structure would be necessary to allow this ramp to pass over University Drive at the west ramp intersection.

Advantages and Disadvantages:

The advantage of this option when compared with Concept 2 would include the following:

- Would provide an exit ramp connection between the southbound SR 143 mainline and the southbound 48th Street connector road. This configuration would eliminate the need to have traffic destined to 48th Street to exit SR 143 at the University Drive TI exit ramp, and then continue through the ramp intersection to continue to the 48th Street connector road.

The disadvantages of this option when compared with Concept 2 would include the following:

- This option would require significant improvements to southbound SR 143 to introduce the southbound connector road exit ramp.
- The southbound connector road exit ramp would be required pass over the University Drive ramp intersections on bridge structure, which would significantly increase the estimated construction cost.
- Additional right-of-way would be required from the property located south of University Drive and west of SR 143.

3.5.4.5 Restore the Ramp from the Eastbound Local Lanes to Southbound 48th Street

The Project Team also evaluated the feasibility of providing a ramp connection between the eastbound local lanes and the southbound 48th Street Connector Road as shown on Appendix D.

The Ramp E-N and the combined Broadway Road/48th Street exit ramp would be designed with an “exit-exit” configuration from the eastbound local lanes. The Broadway Road/48th Street exit ramp would be designed as a two lane exit with one lane developed as a mandatory exit from the outside lane, and the second lane designed as an optional lane with the through movement. The 48th Street exit would be developed as a tapered exit from the Broadway Road ramp. The Department would usually avoid this type of exit ramp configuration with a ramp departing another ramp. However, this exit ramp configuration would serve two service interchange movements and would not include any system interchange movements.

The southbound 48th Street connector road is planned as a two lane roadway. The 48th Street exit ramp would enter the southbound 48th Street connector road with a “lane-add” design that would develop three lanes approaching the Broadway Road intersection.

Travelers on the eastbound local lanes that are destined for Broadway Road would be anticipated to continue to the east on the Broadway Road exit ramp. Traffic destined for southbound 48th Street would use the 48th Street exit ramp and continue to the south. By providing separate ramps for traffic destined for Broadway Road and 48th Street, traffic using the 48th Street exit ramp would not be anticipated to weave across the inside lanes of the southbound 48th Street connector road to make a left-turn at the Broadway Road intersection.

Advantages and Disadvantages:

The advantages of this option would include the following:

- Would restore the existing access between eastbound I-10 to southbound 48th Street (to the south) by providing a ramp connection to the eastbound local lanes.
- Would reduce the traffic demand on the 40th Street TI, the 40th Street/Broadway Road intersection, and at the Broadway Road TI.

The disadvantages of this option would include the following:

- This option would require Ramp E-N to be shifted further to the south, which may require additional right-of-way acquisition from the residential development located south of I-10 and west of 48th Street.

3.5.4.6 SR143 TI Concept with Broadway Road (Westbound) to University Drive Connection

This option was developed to provide a “slip ramp” connection between the westbound Broadway Road entrance ramp and the University Drive TI (to access SR 143) as shown in Appendix D. This option would allow traffic on westbound Broadway Road to access northbound SR 143 without being required to travel through the Broadway Road TI and 48th Street signalized intersections. This option would only be feasible with the I-10/SR143 TI Options 2 or 3.

This “slip ramp” would be developed as a tapered exit from the westbound Broadway Road entrance ramp, and then merge with the University Drive exit ramp with a “lane-add” design that would continue to the north to the University Drive TI. The east ramp intersection would be reconfigured to provide a “modified SPUI” configuration that would allow traffic to pass through the ramp intersection and continue to the north to enter northbound SR 143 mainline.

Advantages and Disadvantages:

The advantages of this option would include the following:

- Would provide an additional travel route between westbound Broadway Road and University Drive and northbound SR 143.

The disadvantages of this option would include the following:

- This option would impact the existing parking lot used by the multi-story office building that includes Maricopa Community College.
- The additional roadway width required on the northbound University Drive exit ramp would require the acquisition of additional right-of-way from the existing commercial developments located east of SR 143.

3.5.5 Baseline Road TI Eastbound Exit Ramp

3.5.5.1 Option 1: Ramp Connection with Eastbound Express Lanes

This option would retain the existing ramp connection from the eastbound I-10 express lanes. The roadway concept plan, 2030 traffic volume projections, lane diagram, and level-of-service analysis results is provided in Appendix D.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The existing Baseline Road exit ramp configuration would remain in its current configuration.
- Out-of-town travelers that are destined for the Arizona Mills Mall, Pointe South Mountain, and other commercial and residential developments would be able to use the current Baseline Road exit ramp that would be located near the geographic location of their intended destination.
- No new right-of-way acquisition would be required from the existing office and commercial developments west of I-10 and between the Western Canal and Baseline Road.

The disadvantages of this option would include the following:

- Travelers entering the eastbound local lanes from Buckeye Road (Rental Car Center and PSHIA west entrance), 32nd Street, 40th Street, SR 143 (including PSHIA east entrance), and Broadway Road would not be able to exit the freeway system at Baseline Road.
- Since the Baseline Road exit ramp would remain connected to the I-10 express lanes, the operational characteristics of the express lanes approaching the I-10/US60 TI could be negatively impacted with this option.

3.5.5.2 Option 2: Ramp Connection with Eastbound Local Lanes

This option would retain the existing ramp with a connection with the eastbound local lanes. The roadway concept plan, 2030 traffic volume projections, lane diagram, and level-of-service analysis results is provided in Appendix D.

Advantages and Disadvantages:

The advantages of this option would include the following:

- Travelers entering the eastbound local lanes from Buckeye Road (Rental Car Center and PSHIA west entrance), 32nd Street, 40th Street, SR 143 (including PSHIA east entrance), and Broadway Road would be able to exit the freeway system at Baseline Road.

- Eliminating the Baseline Road ramp connection from the I-10 express lanes could improve the operational characteristics of the express lanes approaching the I-10/US 60 TI.
- No new right-of-way acquisition would be required from the existing office and commercial developments located west of I-10 and between the Western Canal and Baseline Road.

The disadvantages of this option would include the following:

- Out-of-town travelers that are destined for the Arizona Mills Mall, Pointe South Mountain, and other commercial and residential developments would be required to exit the I-10 express lanes at 32nd Street to use the local lanes to access the Baseline Road exit ramp.

3.5.5.3 Option 3: Ramp Connections with Eastbound Express and Local Lanes

This option would restore the existing ramp connection with the eastbound I-10 express lanes, and provide an additional connection to the eastbound local lanes as shown on Appendix D.

Advantages and Disadvantages:

The advantages of this option would include the following:

- The existing Baseline Road exit ramp configuration would remain in its current configuration with a connection to the I-10 express lanes.
- Out-of-town travelers that are destined for the Arizona Mills Mall, Pointe South Mountain, and other commercial and residential developments would be able to use the Baseline Road exit that would be located on the express lanes near the geographic location of their intended destination.
- Travelers entering the eastbound local lanes from Buckeye Road (Rental Car Center and PSHIA west entrance), 32nd Street, 40th Street, SR 143 (including PSHIA east entrance), and Broadway Road would be able to exit the freeway system at Baseline Road.

The disadvantages of this option would include the following:

- Since the Baseline Road exit ramp would remain connected to the I-10 express lanes, the operational characteristics of the express lanes approaching the I-10/US60 TI could be negatively impacted with this option.
- New right-of-way acquisition would be required from the existing office and commercial development located west of I-10 and between the Western Canal and Baseline Road.
- This option would be anticipated to significantly increase the project cost for right-of-way and construction when compared with Options 1 and 2.

3.6 OTHER DESIGN OPTIONS CONSIDERED

3.6.1 Introduction

Additional design options were evaluated by the Project Team in response to additional requests from project stakeholders during the study process. These options were evaluated separately because they did not influence the selection of the I-10 Widening Alternatives and Local Access Options that were included in the formal alternatives screening process.

3.6.2 Buckeye Road Exit from Sky Harbor Boulevard Ramp S-E

The PAD recently requested an evaluation of a possible “slip ramp” connection to Buckeye Road from the southbound I-10 to eastbound Sky Harbor Boulevard directional ramp. This new ramp would provide direct access from eastbound (southbound) I-10 to the Rental Car Center.

A plan view drawing, lane diagram, traffic volume projections, signing concept plan, and level-of-service analysis results is provided with Appendix E. Three general-purpose lanes and one HOV lane would be retained on eastbound I-10 near the I-10/SR51/SR202L TI. The southbound SR 51 directional ramp (2 lanes) would enter the I-10 mainline with a “lane-add” design and continue to the south to the Washington/Jefferson Street TI exit ramp (2 lanes). This ramp would be developed as a mandatory exit from the outside freeway lane, with the second lane designed as an optional lane with the freeway through movement.

The Jefferson Street entrance ramp would be designed with a parallel entrance configuration that would transition into an auxiliary lane that continues to the Sky Harbor Boulevard exit ramp. The Sky Harbor Boulevard exit ramp (2 lanes) would be developed as a mandatory exit from the outside freeway lane, and the second lane designed as an optional lane with the freeway through movement. The Buckeye Road exit ramp would be developed as a tapered exit from the outside lane of the Sky Harbor Boulevard directional ramp.

The weaving length that would be provided between the Jefferson Street entrance ramp and the Sky Harbor Boulevard exit ramp would just meet the minimum design criteria. Similarly, the distance provided between the Sky Harbor Boulevard exit ramp gore and the Buckeye Road exit ramp gore would be the minimum spacing allowed by the design criteria. The length of the Buckeye Road exit ramp would be approximately 600', which would be extremely short and would introduce safety concerns.

The Buckeye Road slip-ramp would introduce an additional access point that would add approximately 400 to 800 vehicles in the peak periods to the weaving segment between the Jefferson Street entrance ramp and the Sky Harbor Boulevard exit ramp. The added volume of weaving traffic would introduce congestion on the I-10 mainline in this area.

The required geometrics and signing for this ramp would also require an out-of-town driver to make a number of complicated driving decisions within a short travel distance approaching the ramp, which also could introduce safety concerns.

Due to these issues, the design team would recommend that the slip ramp connection to Buckeye Road not be carried forward for more detailed evaluation.

3.6.3 Baseline Road Northbound Braided Entrance Ramp

The segment of the westbound local lanes between Baseline Road and US 60 will experience congestion during the peak travel periods. Travelers on northbound I-10 that are destined to eastbound US 60 is required to weave across traffic entering from the northbound Baseline Road

entrance ramp. The Project Team evaluated the possibility of providing a braided ramp configuration at Baseline Road to eliminate the weaving conditions in this area.

The roadway concept plan, 2030 traffic volume projections, lane diagram, and level-of-service analysis results are provided in Appendix E.

Traffic on Baseline Road that is destined to westbound I-10 would be required to be in the left lane of the northbound entrance ramp to pass beneath the westbound local lane roadway, and then merge into the westbound local lanes with a ‘lane-add’ configuration south of US 60.

Baseline Road traffic that is destined to eastbound US 60 would be required to be in the right lane of the entrance ramp to continue to the north. The entrance ramp would merge with the westbound local lanes with a parallel entrance configuration that transitions into an auxiliary lane that continues to the Ramp N-E exit.

This alternative would eliminate the weaving conditions on the westbound local lanes between Baseline Road and Ramp N-E (to US 60). However, this option may require the acquisition of a small portion of the Arizona Mills Mall property adjacent to their parking lot perimeter road.

Representatives of the Project Team, ADOT, MAG, FHWA, and cities of Phoenix and Tempe recommended that this option be carried forward to the DCR and EIS phase of development. However, the design of the ramp should be refined to attempt to shift the ramp bifurcation further to the north to allow for additional weave/sort distance between the ramp intersection and the bifurcation.

3.6.4 Warner Road HOV Ramps

3.6.4.1 Introduction

The *MAG Value Lanes Study* identified a potential future HOV ramp near Warner Road to provide direct access between the I-10 HOV lanes and a future park and ride lot (or access road). The HOV ramp is not included in the RTP.

The City of Tempe requested an evaluation of a future HOV ramp connection at Warner Road. The *MAG Park and Ride Lot Location Study* identified a potential park and ride lot site at the Agave Center east of I-10 and south of Warner Road. The City of Tempe has not selected a site for a park and ride lot in this area.

The City of Phoenix will not support an HOV ramp connection with an arterial street at an existing interchange. Providing an HOV ramp intersection within an existing diamond interchange would negatively impact the safety and operational characteristics of the interchange.

However, Phoenix would support a separate HOV ramp connection between I-10 and a park and ride lot (or access road). If a park and ride lot site is feasible east of I-10, Phoenix would request HOV ramp connections to the north and south of the access road to allow their I-10 East BRT buses to incorporate this park and ride lot into the route.

In response to this request, five alternatives were developed for an HOV ramp and access road to a potential future park and ride at the Agave Center. Each alternative was developed in conjunction with the Alternative 2 I-10 Widening concept.

3.6.4.2 Option 1

Option 1 would provide a direct connection between the I-10 HOV lanes and a park and ride access road as shown in Appendix E. A new access road bridge would be constructed over the westbound I-10 mainline and northbound Warner Road exit ramp approximately 1,200 feet south of Warner Road.

A two lane access road would be constructed between the HOV ramps and the park and ride lot. A bridge or box culvert would be provided for the access road crossing of the east drainage channel. The drainage channel conveys offsite flows to the south and discharges into the Warner Road pit.

The HOV lane ramps would be provided north and south of the access road bridge. Retaining walls would be provided along the ramp to minimize the widening required for the I-10 mainline. The I-10 eastbound and westbound roadways would be realigned to develop the median width necessary for the HOV ramp, the HOV ramp gores, and to maintain continuity of the mainline HOV and general-purpose lane and shoulder widths.

The Warner Road TI south ramps would be realigned to coincide with the new mainline roadway width. A retaining wall would be provided along the southbound entrance ramp to minimize the acquisition requirements from the residential development west of I-10. A retaining wall would also be required along the northbound exit ramp to avoid impacting the existing drainage channel.

Approximately eight residences would be impacted by this alternative. Additional right-of-way would also be required east of I-10 along the northbound exit ramp.

The HOV ramps would provide direct access between I-10 and the park and ride lot for the BRT and express bus routes. Passenger cars with multiple occupants would most likely use the Warner Road TI ramps to access I-10 since they would not originate from the park and ride facility. These vehicles would then be required to weave across the general-purpose lanes to access the HOV lanes, which would impact the operations on the I-10 mainline similar to the existing condition.

This alternative does not appear to be prudent due to the limited traffic demand for the HOV ramp, limited benefit to the operation of the I-10 mainline, impacts to the existing residential development, and incremental project costs.

3.6.4.3 Option 2

Option 2 would provide a direct connection between the I-10 HOV lanes and Warner Road as shown in Appendix E. The Warner Road TI underpass would be modified to add a new ramp intersection with Warner Road. Access to the park and ride lot would be provided from Warner Road.

The HOV lane ramps would be provided north and south of the access road bridge. Retaining walls would be provided along the ramp to minimize the widening required for the I-10 mainline. The I-10 eastbound and westbound roadways would be realigned to develop the median width necessary for the HOV ramp, the HOV ramp gores, and to maintain continuity of the mainline HOV and general-purpose lane and shoulder widths.

The Warner Road TI south ramps would be realigned to coincide with the new mainline roadway width. A retaining wall would be provided along the southbound entrance ramp to minimize the acquisition requirements from the residential development west of I-10. A retaining wall would also be required along the northbound exit and entrance ramps to avoid impacting the existing drainage channel and the planned Emerald Center commercial development.

Approximately ten residences would be impacted by this alternative. Additional right-of-way would also be required east of I-10 along the northbound exit and entrance ramps. Planned development within the Emerald Center would be impacted by acquisition of additional right-of-way.

Due to safety and operational concerns associated with the Warner Road TI, the HOV ramp intersection would likely be restricted to right-in/right-out turning movements. The restricted turning movements at the HOV ramp intersection would require all left-turning vehicles to access I-10 with the existing interchange ramps. For example, southbound HOV lane traffic destined for eastbound Warner Road would be required to weave across the mainline general-purpose lanes, depart I-10 at the southbound exit ramp, and make a left turn at the ramp intersection. This weaving maneuver would eliminate the benefit the HOV ramps typically would provide in eliminating all weaving movements between HOV and general-purpose traffic on the mainline.

Roundabouts could be provided at the ramp intersections to allow the HOV traffic to make a left turn movement through the roundabout. For example, southbound HOV traffic destined to eastbound Warner Road could travel in the HOV connector, turn right at the HOV ramp intersection (west on Warner Road), and then travel through the roundabout to access eastbound Warner Road. During discussions it was determined right-of-way restrictions, and the projected volume of traffic at the ramp intersections, would preclude the use of roundabouts at the intersections.

This alternative does not appear to be prudent due to the limited traffic demand for the HOV ramp caused by the controlled access at the ramp intersection, limited benefits to the operation of the I-10 mainline, impacts to the existing residential development, and incremental project costs.

3.6.4.4 Option 3

Option 3 would provide a direct connection between the I-10 HOV lanes and the Warner Road TI exit and entrance ramps as shown in Appendix E. Access to the park and ride lot would be provided from Warner Road.

The HOV lane ramps would be provided north and south of the access road bridge. Retaining walls would be provided along the ramp to minimize the widening required for the I-10 mainline. The I-10 eastbound and westbound roadways would be realigned to develop the median width

necessary for the HOV ramp, the HOV ramp gores, and to maintain continuity of the mainline HOV and general-purpose lane and shoulder widths.

The HOV ramps would rise within the median, cross over the I-10 eastbound or westbound roadways on a bridge structure. The HOV ramp would then merge into the diamond interchange entrance and exit ramps approaching or departing the ramp intersection. A weave-sort area would be required on the ramps between the HOV ramp connection and the ramp intersection.

The existing Warner Road TI ramps would be realigned to coincide with the mainline roadway width. A retaining wall would be provided along the southbound exit and entrance ramps to minimize the required acquisition requirements from the existing residential development west of I-10. A retaining wall would also be required along the northbound exit and entrance ramps to avoid impacting the existing drainage channel and the planned Emerald Center commercial development.

Approximately twelve residences would be impacted by this alternative. Additional right-of-way would also be required east of I-10 along the northbound exit and entrance ramps. Planned commercial development within the Emerald Center would likely be impacted by the acquisition of additional right-of-way.

This alternative could potentially expose drivers on the HOV and exit ramps to a high speed weaving maneuver in advance of the ramp intersection. For example, buses departing the I-10 HOV lane destined to westbound Warner Road would be required to weave across exit ramp traffic destined to eastbound Warner Road. Similar weaving maneuvers would be required at the entrance ramps. These required weaving maneuvers could potentially impact the safety and operational characteristics of the interchange.

This alternative would introduce safety and operational concerns within the weave-sort areas approaching and departing the ramp intersections. The alternative would also cause substantial impact to existing residential development and would substantially increase the project cost. Therefore, this alternative does not appear to be prudent for implementation.

3.6.4.5 Option 4

Option 4 would provide a one-way access road connection between the future park and ride lot and the Warner Road TI exit ramp. Inbound buses destined to downtown Phoenix would be provided a direct route to the freeway system with a connection with the northbound exit ramp. The buses would continue through the ramp intersection and enter I-10 on the northbound entrance ramp. All other HOV traffic would use the existing interchange ramps to access Warner Road. This option is depicted in Appendix E.

The existing drainage channel would be required to be placed within a culvert for a significant length to support the access road, resulting in additional construction costs associated with the project. Right-of-way acquisition would be required in the southeast quadrant of the interchange.

Vehicles entering the exit ramp from the park and ride lot would be required to merge with higher speed traffic departing I-10 on the exit ramp. This maneuver could potentially impact the safety and operational characteristics of the exit ramp.

Since this alternative would address only one movement from the future park and ride lot, and could negatively impact the safety and operational characteristics of the northbound exit ramp, this alternative does not appear to provide substantive benefits for implementation consideration.

3.6.4.6 Option 5

Option 5 would provide a direct connection between the future park and ride lot and the I-10 northbound general-purpose lanes. A slip-ramp would braid under the northbound exit ramp and merge with the northbound I-10 general purpose lanes as a tapered entrance prior to the Warner Road TI northbound entrance ramp gore. All other HOV traffic would use the existing interchange ramps to access Warner Road. This option is depicted in Appendix E.

The location of the braided slip ramp would provide a minimal acceleration lane length for buses prior to merging into the general-purpose lanes. This condition could impact the safety and operational characteristics on the I-10 mainline.

The existing drainage channel would be required to be placed within a culvert for a significant length to support the access road, resulting in additional construction costs associated with the project. Right-of-way acquisition would be required in the southeast quadrant of the interchange.

Since this alternative would address only one movement from the future park and ride lot with a moderate anticipated project cost, and could impact the safety and operational characteristics on the I-10 mainline, this alternative does not appear to provide substantive benefits for implementation consideration.

3.6.4.7 Conclusion

The alternatives evaluated to provide HOV access to either Warner Road, or an access road to a park and ride lot in the vicinity of Warner Road, were eliminated from further consideration. Representatives of ADOT, FHWA, Phoenix and MAG recommended the elimination of the HOV ramp alternatives near Warner Road due to the apparent limited HOV access benefits versus the anticipated cost and impacts caused by the ramps. The potential operational, safety, right-of-way impacts and cost would not appear to be prudent versus the limited value to the planned HOV system.